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ABSTRACT

Presented are student papers from a science curriculum class at the Florida Institute of Technology. Topics of the papers include Outdoor Biological Instructional Strategies, Individualized Instruction, Nonmajor Science Education, Secondary School Remedial Mathematics, Advanced Placement Program, "Biology: Living Systems," public law 94-142, physics curriculum, and microcomputers. (DS)

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CURRICULUM REPORTS

1981

SE 5050

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SE 035 720

The following papers are presented in partial fulfillment of the requirements for SE 5050. Each paper represents the interests and responsibilities of its author. The Florida Institute of Technology refers all comments to the individual authors.

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OBIS: Outdoor Biology

Instructional Strategies

Edward P. Donovan
National Curriculum Project Report
Secondary School Curriculum
SE-5050
Mr. Robert F. Richmond
Science Education Department
Florida Institute of Technology
August 6, 1981

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Historical Background

OBIS, which is an acronym for the "Outdoor Biology Instructional Strategies", was started in 1972 by members of the staff of the Lawrence Hall of Science, Berkeley, California. The principal initiators of the projects were Dr. Watson M. Laetsch (Director), Dr. Herbert Thier (Co-director), and Dr. Chester Lawson, all members of the professional staff at the Lawrence Hall of Science during that time. OBIS was supported during its developmental years by a grant from the National Science Foundation (Lockard, 1977).

The major reason the project was started was to enable youth groups to get firsthand experiences in working in the outdoor biological environment. It was hoped through this project that youngsters would be able to make more intelligent environmental decisions as adults. The project started by identifying the youth groups that needed activities of this type. The two activity manuals developed were the Pond Unit and Lawn Unit. These were not found to be adequate to meet the needs of the target groups. Each unit had a sequence of 10-15 activities organized to build ecological concepts but were not flexible and overly academic (McCormack, 1974).

In early 1974, the folio format was developed in which each activity was a separate unit. Each activity included background for the leader on the activity's major concept, the activity

challenge for the children, listing of materials necessary, preparation necessary, outline of the action, suggested questions, follow-up activities and other related OBIS activities.

Twenty-four activities were developed, with some dealing with aquatic environments and others dealing with terrestrial environments. These made up the Trial Edition I. This was found to be an effective format (McCormack, 1974; Fairwell, 1980; Kellogg, 1980).

Since that time, 97 activites were developed in trial edition sets I to IV. At present, the activities are being published commercially by Delta Education, which has divided up the activities into modules. The present modular form includes 6-10 activities each, which were grouped together because they were related. Each module was given a general heading such as "Adaptation" or "Animal Behavior", etc.

Target Population

The OBIS activites were developed to be used by English speaking children, 10-15 years old, of all ability levels. They also can be used successfully by both younger and older people. The activities are not school classroom curriculum. OBIS is a community oriented curriculum directed toward YMCA camps, museum groups, after-school ecology clubs, scouts, church youth groups, nature centers, and other organizations dealing with 10-15 year olds. The project was developed for use by a wide variety of people; therefore the materials were set up with the assumption that the leaders have no training in natural history or biology. An OBIS leader is usually a teacher, Girl Scout leader, den leader, Scout master, camp counselor, volunteer, parent, student or almost

anyone who works with children (Kellogg, 1980; Booth, 1979).

Purpose

The major purpose of OBIS according to Lockard (1977) is:

> If we are to make intelligent decisions regarding the future of our ecosystem, we must have a thorough understanding of basic biological relationships. The ecological understanding that grows with each OBIS experience will provide a base that youngsters can use in the future to consider environmental and ecological decisons more intelligently. (p. 372)

Objectives

McCormack (1977) lists the specific objectives of OBIS as:

1. To stimulate the curiosity of children about their local environment.
2. To develop the investigative and observational skills of each child.
3. To teach basic concepts of ecology through the interaction with the biotic and the abiotic factors in the environment.
4. To have the children better understand man's role in ecosystems.
5. To provide exciting and educational outdoor experiences for group leaders and children.

Theme

The theme of OBIS is the ecosystem, and deals with topics such as natural selection, succession, seasonal changes in life forms, food chains, species dominance and density, behavior, interaction of organisms with their environment and population structure. The OBIS activities promote an ecological theme which is very

flexible and adaptable to children of all ages, capabilities, interests, and background (Fairwell, 1980).

Approach and Methods

The OBIS project follows a discovery approach in which the students are active participants. The strategies used include games, simulations, craft activities, discussion, role playing, experiments and different types of data analysis (Fairwell, 1980).

The activities focus on local environments near the children's homes such as lawns, ponds, streams, vacant lots, etc. The activity modules are very flexible involving many entrance and exit points. The activities tie together the physical sciences, biological sciences, social sciences, art, recreation and psychology (McCormack, 1974).

The activities require very simple inexpensive and homemade equipment. Children may work individually, in groups of 2-12, or even larger groups (Lockard, 1974). The activities can be done almost anytime of the year. Generally, the individual activities take no longer than one hour of time from start to finish. The activities can be combined and used in full day field trips or less (McCormack, 1974).

Activity Cards

Each activity card consists of a number of major parts. There is an Overview, which introduces the major concepts of the activity and the major objective. There is a Bio Key, which indicates the type of activity and the major concepts to be developed. Following is the Background, which briefly summarizes the information needed by the leader. The Materials section lists all material needed, including optional materials and also states

if the equipment is available through Delta Education. Preparation states the conditions needed for the activity, such as group size, time, site, etc. This is followed by step-by-step instructions in the Action, in which the leader explains to the students what they must do in the form of a challenge. Finally, after students have completed the activity, information is shared, and the major concepts are then introduced. Optional activities are included in the Branching Out part of the activity (example in the appendix).

Each of the new OBIS modules put together by Delta Education include a Leader's Survival Kit (Leader's guide) which explains: (1) what OBIS is, (2) why OBIS, (3) how to use the OBIS folios, and (4) various suggestions on basic equipment, aids, guides, site selection, safety and conservation rules. Some of the activities contain areas entitled What Do You Think?, which contains questions for discussion and help to expand on the significance of the activity. Other activities contain Action Cards, which must be duplicated. The action cards are used especially in the game-oriented activities (Fairwell, 1980). (A listing of the OBIS activities produced by Delta Education are included in the appendix)

Resources

Over the past five years, OBIS has developed a network of resource centers throughout the country. These resource centers were developed to answer requests for information, materials, and sponsor workshops. The director of each center is well informed about the OBIS philosophy, approach and use of the materials. Directors are not funded; therefore, the director service varies from one center to another. Each center provides general information and display copies of OBIS materials. The centers are

expected to offer at least three inservice or preservice workshops per year (Fairwell, 1980).

There are 95 OBIS resource centers throughout the country, including two in Canada. A recent survey of OBIS resource center activities over the past five years (1975-1979) reports that 33,000 adults participated in OBIS training workshops. Of the adults, 36% were with community groups, while 64% were with schools. It has been estimated that over 786,000 youngsters have participated in OBIS activities because of resource center activities. It was reported that 60% of the children were 7 to 10 years old and 40% were 11 to 13 years old (Kellogg, 1980).

The Florida OBIS Director is Dr. David LaHart, whose office is at the Florida Solar Center at Cape Canaveral, Florida. I interviewed him recently about the status of OBIS in Florida. This will be discussed later in the paper.

Other resources that are available through OBIS are:

1. A 15 minute film on OBIS that can be rented or purchased from Delta Education, Inc., Nashua, N.H. This film can be used in OBIS workshops.

2. A publication for those interested in leading an OBIS workshop, entitled "Primer: How to Lead an OBIS Workshop" (DeLucchi and Knott, 1979).

3. The OBIS Newsletter, which reports on the progress of OBIS. It is published twice a year and is free of charge.

4. The OBIS Resource Center Directory, listing all OBIS directors for each state and their addresses (Included in the appendix).

5. Various promotional publications put out by Delta Education on the OBIS program.

6. An OBIS Sampler, available from Delta Education, for only $5.90, which gives a sampling of various OBIS strategies (In appendix).

7. Two booklets, the Pond Guide (Buller, 1978a) and Lawn Guide (Buller, 1978a), are also available. They are guides to identifying organisms found in these ecosystems. The booklets contain pictures and brief descriptions of the most common organisms.

It should be mentioned here that the OBIS coordinator for Delta Education is Kathleen A. Crouch, whose office is located in Nashua, N.H. She sent me a large number of materials on OBIS. A copy of the letter I received from her is in the appendix (Crouch, Note 2).

Additional Activities

Besides the regular OBIS modules, there are a variety of more specialized OBIS modules which can be used with very specific groups.

One of these special OBIS modules is the OBIS Trail Module, which explores both the impact of a foot trail on a hillside area and the effect the steepness of the trail has on the people who use it. One of the activities is called "Cardiac Hill" and deals with the effect that hiking up a steep trail has on human pulse rate (Buller, 1977).

Another of these special OBIS modules is the ACA/OBIS Camp Kit, which was developed to provide activities that meet the particular needs of campers. The four modules that make up this kit include activities which deal with developing environmental

awareness, knowledge of natural history, understanding the meaning of ecology, and understanding environmental quality (Buller, 1977).

A recent program using OBIS for family campers was held with great success at the Ouachata National Forest in the South Central region of the U.S. A total of 917 people participated in the program and responses to questionaires by participants were extremely positive (Kellogg, 1980).

Recently, the project materials have been translated into Spanish for use by the California Mini-Corps, a program for children of migrant workers (Booth, 1979).

Development and Evaluation

The major methods used in development and evaluation of OBIS is discussed by Falk et al (1975). Falk and his associates at the Chesapeake Bay Center for Environmental Studies in Edgewater, M.D. were actively involved in OBIS evaluation during 1972 to 1974. Some interesting comments by Falk and his associates about the evaluation and development process for OBIS were made. They stated that all OBIS activities developed are tried and evaluated at least three times (Phases I, II, and III) before they are ready for commercial distribution. All of the initial activities originated from OBIS staff members who are science teachers of various levels. The staff member starts the process by organizing an ecology idea into an activity. This is the beginning of Phase I of the development process. In order for an activity to be developed, it must meet six qualifications:

1. It must increase the understanding of ecology.
2. It must be able to be used by 10-15 year olds.

3. It must be designed for a readily available outdoor site.

4. It must be able to be used by untrained leaders.

5. It must last about one hour.

6. It must require only simple, inexpensive materials, that can be easily purchased or made by the leader.

If the activity meets the above qualifications, the OBIS staff member who originated the idea tries the activity out with a small number of students while another OBIS staff member observes. Both staff members prepare a report evaluating the activity. They must indicate which aspects of the activity succeeded and which failed. The activity is then recommended to be dropped, revised and retested using the same procedure again, or moved to Phase II.

In Phase II of development, the staff member writes the activity and develops the materials necessary to be used by a local youth group. Staff members observe the groups using the activity, write reports, and discuss the activity with the leader to get suggestions. The major emphasis at this time is placed on evaluating and revising the leader instructions. During Phase II, most of the evaluation is based on observation. There is a small amount of pilot testing done and written feedback on specific forms for students and leaders are used. Successful activities will go to Phase III; others are retested at Phase II or dropped.

Phase III requires that the activities are distributed to leaders and their groups in the local area. Materials are still provided at this point but instructions for making equipment are also included. Also, at this point, a certain amount of nationwide testing is carried out. Since OBIS staff members cannot observe all groups, written reports of leaders and youngsters are

used. Also, a photographic technique using a wide-angle lens, taking photographs at predetermined times is used to determine the percentage of student involvement. The four major purposes of Phase III are:

1. to determine the educational value of the activity.

2. to find out the attitude of the leaders and youngsters toward the OBIS materials.

3. to determine equipment effectiveness.

4. to determine if the students were actively involved in studying the ecosystem.

The major evaluation philosophy of OBIS is that the evaluation instruments have the same design and format as the OBIS activities themselves. For example, the evaluation activity for quadrant censusing is to census the number of loops of yarn in a square of shag carpet. The activity can be evaluated in this way before students go outdoors. Each of the evaluation instruments are adapted using the same Phase I to Phase III system used in regular activity development.

It is important to note here that no testing as we think of school testing takes place. This is because the OBIS curriculum was originally developed for non-school groups. The OBIS evaluation and development system requires three major components which are ideas, trials, and evaluation by observations and comments.

It should also be noted that, because OBIS activities are non-school, they must compete for time with sports, crafts, recreation, and social events. This requires that all OBIS materials are evaluated for enjoyment, practical usability, and educational soundness.

At the present time, feedback on the activities can be either sent to the Lawrence Hall of Science or Delta Education. When I contacted Dave Buller, the OBIS coordinator at the Lawrence Hall of Science, he stated that they go through every evaluation received from leaders and participants. The evaluations are reviewed and filed for future reference. He also stated that at the present time, they have not developed a method of analyzing all the feedback with a computer, but they are working on this. It was also mentioned in the conversation on the telephone that there are a number of outdoor education groups presently evaluating the OBIS curriculum, and he hopes to get feedback from these groups as soon as they have completed their studies (Buller, Note 1). (Copies of the feedback forms are included in the appendix of this paper)

Murtha (1977) at the University of Maine, decided to try the OBIS activities in a life science curriculum on seventh graders in a Maine junior high school. She found that it was very easy to incorporate many of the OBIS activities into her life science class. Murtha and her students found the activities to be very easy to adapt for school use and found that students who usually were not interested in science actually became interested for the first time while using OBIS.

Evaluation by F.I.T. Summer Program Teachers

During the present summer, I volunteered to introduce OBIS to the science teachers involved in the Methods of Individualizing Science Instruction course offered by Dr. Phillip Horton, Assistant Professor of Science Education at Florida Institute of Technology. I decided to approach the introduction of the OBIS curriculum to

the 11 teachers in the course by having them do an actual OBIS activity with myself as the group leader. The activity I chose was the Stickler activity whose purpose is to introduce the concepts of "habitat" and "distribution". After completing the activity, which required about one hour, I then gave the group an evaluation form which I developed to get their general feelings about the particular activity and the OBIS curriculum in general. My personal evaluation of the activity as the leader was that it was everything that the developers of OBIS stated. It was simple to coordinate, the materials were easily prepared, the teachers were all actively involved, and, in fact, the activity was exciting and very interesting. The folio format was very easy to follow. I would recommend the OBIS curriculum for use in schools.

The teacher evaluations I received are summarized in the Activity Evaluation Form located in the appendix. I will briefly summarize the teachers' comments:

1. Generally, the teachers felt the format would attract student attention and curiosity.

2. Most of the teachers found the content to be stimulating.

3. At least half of the teachers found the activity to have a good balance between scientific content and process.

4. Most teachers stated that difficult terms were explained and it utilized an inquiry approach.

5. Most teachers stated that the activity provided for individual differences and provided problem-solving situations.

6. Almost all the teachers stated that the activity was clear, understandable and very adaptable.

7. Everyone felt that the activity provided a great opportunity for students to share their findings.

8. All but one teacher felt that the activity primarily presented concepts and relationships and not facts.

9. Most of the teachers felt that the activity pace was just right.

10. All but one teacher felt the activity was at the right content level for the intended audience.

11. Most of the teachers decided that the objectives were realistic and that the content and style were interesting.

12. All teachers stated that the activity utilized available resources effectively.

13. Generally, most of the teachers felt the most outstanding element of the activity was their active participation.

14. Only one of the teachers felt that the activity should be modified. This particular teacher was uncomfortable with the discovery approach and would have liked more information before the activity was started.

15. On a scale of 1 to 10, with 10 as the highest, the teachers rated the activity on the average as an 8.5.

16. Eight of the ten teachers who submitted the evaluation said they would use the OBIS in the classroom if they taught biology or environmental science.

17. Nine of the ten teachers said they would recommend OBIS to teachers at their school. The one teacher who didn't vote yes was not sure at this time.

Generally, I felt the activity went quite well and that the teachers were impressed with OBIS. Included in the appendix is a

copy of the Stickler activity, the Leader's Survival Kit, the map used in the activity, a summary of the teacher evaluations and copies of the individual teacher evaluations (Donovan, Note 3).

OBIS in Florida

I also visited Dave LaHart's office at the Solar Energy Center. He is the Florida OBIS Resource Director and the Environmental Education Coordinator for our area. He stated that OBIS is losing its interest in Florida. It has been six years since he has offered an all-day OBIS workshop for any group. He attributes the absence of interest to: (1) the lack of requests received, (2) all the environmental education programs that most Florida school districts have developed themselves, (3) the introduction of a new environmental education program called Project Learning Tree, which is free at the present, whereas OBIS costs money, (4) the low number of inservice days available to teachers, and (5) the lack of funds to support workshops. At the present time, most of Mr. La Hart's time involves contracts with Florida school districts to hold environmental education workshops. At these workshops, he normally introduces all of the major environmental education programs, lets the teachers do one activity for each program and then lets the teachers decide which they like the best. So, at the present time, he gives no special emphasis to OBIS. He treats it as all the other environmental education programs. He did state that during 1972 to 1975, he was constantly giving OBIS workshops, but at the present time the interest is not really there. One statement that he did make which surprised me was that he has very little contact with science teachers in Brevard County. He seems to think that they have forgotten he is there, so most of his

time is spent outside of Brevard County in other school districts like Dade and Orange Counties (LaHart, Note 4).

Conclusions and Comments

It is easy to see why the OBIS program has been so successful since its beginnings in 1972. The curriculum plan developed and evaluated was well done for the non-school youth groups for which it was developed. The following comments about the OBIS program are made in reference to the curriculum textbook by Saylor et al (1981):

1. The general curriculum plan of OBIS is of both the Generic Curriculum and Site-Specific types. It is an instructional package and also a national curriculum project. It seems to have taken the best of each approach and incorporated it into its developmental plan.

2. The basic approach to the development of the specific activities follows the inductive approach which is a "top down" operation. It also incorporates the problem-solving approach.

3. Both data about the learners and society are strongly considered, since the development of activities requires feedback by students and leaders. The involvement of the community outside the school is outstanding since this program was developed for non-school groups.

4. The program stresses current issues dealing with the environment and energy.

5. The hierarchy of purposes, goals, subgoals, and objectives are well defined in the Leader's Survival Guide and each individual activity.

6. The activities are of the discovery type. The program has

considered the development stage of the intended audience, following the educational theories of Piaget. The majority of activities are at the concrete operational stage which is exactly where it should be for the audience for which it was developed. This program makes the children "producers of knowledge, not mere passive consumers" (Saylor et al, 1981, p. 143).

7. A strong point of OBIS is that it stresses both of the two desirable general goals which are development of human traits and the behaviors to be learned. It does a good job of blending the two goals.

8. The curriculum designs used in OBIS include the subject matter/discipline design, the human traits/ processes design and the social functions/activities design. Therefore, the activities are organized by disciplines, through planned processes, and through community activities. This again is a strong point for OBIS since it incorporates the best of each of these design types.

9. The OBIS program also incorporates a large number of teaching models, such as simulation, games, community activities, discussion, group investigation, inquiry training, and role playing. By using a wide variety of these teaching models in one activity, it seems to eliminate any of the negative aspects of the models and emphasizes the positive aspects.

10. Since the program was developed for non-school groups, I can understand the lack of emphasis on using testing for summative evaluation. It would seem that the OBIS staff has been able to put a great emphasis on formative evaluation using the participant feedback forms. It appears that a major weakness of the OBIS curriculum is in reference to summative evaluation. The only

method used is by having students do evaluation activities to see if they understand the activity. A better method of long term analysis of the influences the curriculum has on people involved should be developed. The evaluation system seems to be very effective for measurement of short-term goals, but whether the involvement in activities will enable the youngsters to be better able to make intelligent decisions on environmental issues in the future is questionable. The evaluation models that have been used in the OBIS curriculum consists of a combination of two types which are decision making and responsive.

In conclusion, I would like to say that I have learned much from investigating OBIS. I feel that this curriculum project has made me very aware of the complexities of curriculum development and evaluation.

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Individualized Instruction:
A Review

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Curriculum Study
Mr. R. Richmond
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It has long been thought that the traditional way of teaching, a teacher centered approach, was the best. As a result, most classrooms were designed with desks in rows, all facing the front blackboards where the teacher stood to lecture. Learning was passive and the "ideal" class was quiet, attentive, and often unproductive. Science curriculum was designed to meet the needs of this type of learning situation. Most classes used a single text, from which most materials were taken. Students rarely participated actively. Because all students were taught the same thing at the same time, brighter students often became bored and slower students often fell behind and became frustrated.

In more recent years, curriculum has been faced with far greater challenges than the type of teaching methods used. Secondary school enrollment is predicted to decrease by as much as 25% by 1990. Parents and other members of the community are confronting teachers with questions on accountability and relevancy, while at the same time they are unwilling to increase budgets for installation of new curricula. In addition, teachers themselves are finding their present curricula more inflexible in a quickly changing society, and

the desire to meet the abilities and interests of their students is growing each day.

In order to remedy some of these problems faced by teacher centered curricula, several student centered curricula have been designed to emphasize the individual. As much as 60 years ago, in the 1920's, a school superintendent in Winnetka, Ill. proposed a method for individualizing instruction. He proposed that each child be encouraged to proceed at his own pace. "Instead of a whole class proceeding at the same rate and achieving varying quality, each student proceeded at his own rate, thereby varying time in place of quality."[1] As a student completed a unit, he took a test. If he was successful on the test he would go on to the next unit. If he was unsuccessful, he continued to work on the same unit until further attempts were successful.[2]

Today, individualized curriculum plans are very similar to that described above. However, after all these years, individualized instruction is still a misunderstood teaching method. Many educators mistakenly assume that individualized means independent. Independent study, as defined by Kahle, is a task which the learner does alone. It does not provide for differences in academic ability, in past

achievement, or in required learning time.[3] In contrast, individualization is "any form of instruction which attempts to break down the traditional format of one teacher and one text dispensing learning simultaneously to thirty or more pupils, to one in which one or more teachers provide many varied materials so that each student can learn at an optimum rate dependent upon his scholastic abilities, past experience and educational needs."[4]

Educators also criticize individualized programs as causing "lonely learning," isolating a student to a study carrel with a learning module or tape.[5] Well constructed individualized programs do not isolate students from all teacher/student interactions. They permit the teacher to participate in small group discussions, demonstrate special techniques to a few students, review with one or two students, tutor a student, or evaluate an individual project during class time. This provides a format for interactions between teacher and student and between student and student.[6]

Criterion for evaluation is still another part of individualization which is met with skepticism from teachers and educators. "Our current educational preoccupation with group tests and norm-referenced grades has become a deterrent to individualization

because these standards are inappropriate to an atmosphere where what is valued is individual student growth - regardless of how that growth compares with the group norm."[7] In order for individualization to work, evaluation should be based on the learner's success in meeting specific learning objectives. The criteria for success is personal achievement, and many types of informal evaluation are valid indices of achievement.[8]

These above mentioned concerns or misunderstandings of educators, though serious, are not insurmountable. In an attempt to more specifically look at the problems faced by individualization and how they may be overcome, an actual individualized curriculum program, ISIS, will be investigated. The paragraphs that follow will cover what ISIS is, what ISIS does, what and how ISIS covers science material, costs, and how to use it.

So much of science curriculum today deals with facts and figures which are memorized and forgotten, or simply not learned at all. Students who lack motivation are often "turned off" by science because of this. ISIS, Individualized Science Instructional System, was developed by the National Science Foundation and the Florida State University to meet the

needs of those students disinterested in science.[9] The program deals with Life Sciences and Physical Sciences for grades 9 through 12 in a way that reflects the capabilities and interests of all students. It also considers the values of the community, the facilities of the school, and the preferences and training of the teachers.[10]

When writing ISIS, the staff first identified concepts in science and then wrote objectives which would delineate those concepts in practical terms. Writers were instructed to produce materials that were visually oriented and had low reading levels. The materials were presented in a relevant fashion, often using other forms of media; tape cassettes, flash cards; in addition to the text.[11] Each concept was placed in an individual "minicourse" booklet with accompanying materials rather than in a single text. This adds to the flexibility of the program since it permits students to choose the minicourses of most interest to them.

At present there are 33 minicourses available commercially, covering such science subjects as biology, chemistry, physical sciences, and ecology. In addition, the minicourses deal with applied science, the implications of science, and other useful scientific information, all activity oriented, which

help add relevancy to the program. Each minicourse takes about three weeks to complete, and they may be chosen and arranged in numerous combinations according to the needs and goals of the instructor or school system.

A typical ISIS minicourse contains three sets of activities: core, excursion, and advanced. Planning activities precede each major set of activities. These include sample questions which can be answered by students prior to any instruction. If the student feels confident with his present knowledge of a given activity, the activity may be skipped. Major objectives of each activity are also given in the planning section.

The core activities cover the essentials of the minicourse and all students are expected to complete these activities. Upon completion of the core activities, students take a test covering the core objectives, including those activities which the student may have skipped. Successful completion of the core test paves the way for excursion and advanced activities.[12]

Excursion activities extend the core materials and are selected by students on the basis of interest. The advanced activities are more rigorous and are designed for the college-bound students.

Again, tests are given to evaluate proficiency in excursion and advanced activity objectives.

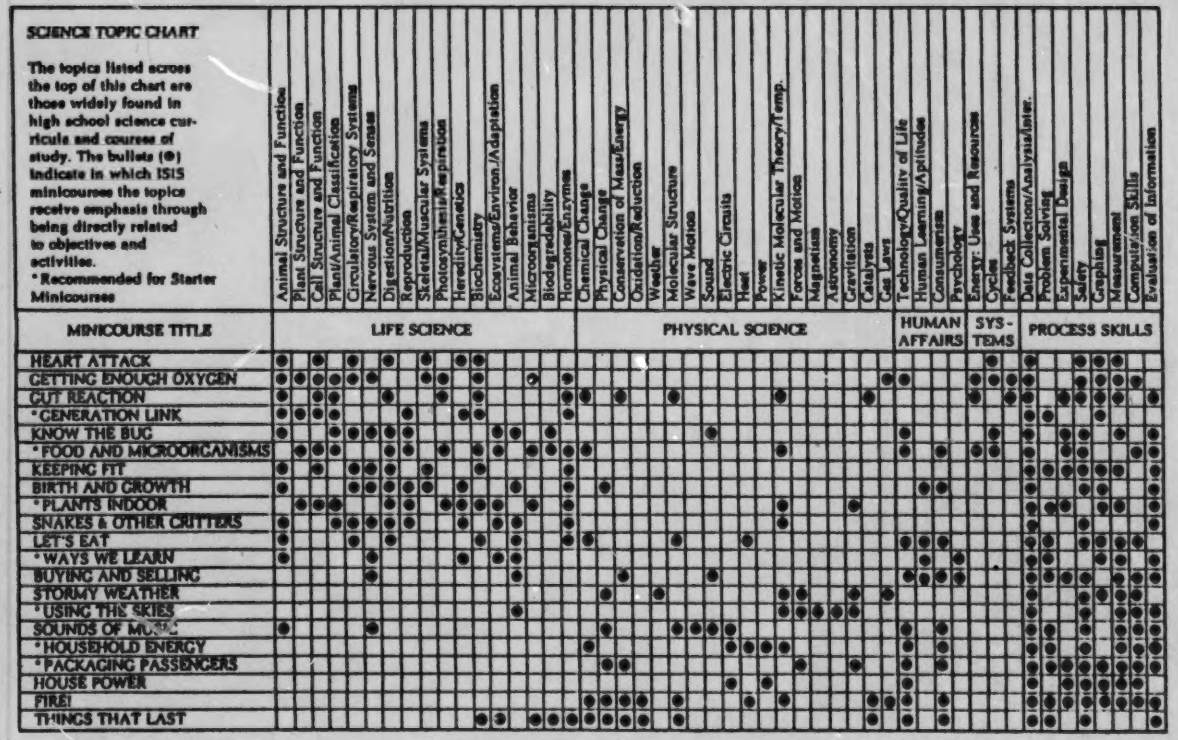
The materials covered in ISIS minicourses do not contain highly technical or difficult information. They do, however, cover a broad range of science concepts and each minicourse may contain activities which overlap skill used in biological and physical sciences. (see chart)

The cost of ISIS varies with the minicourse. Each student booklet costs $2.70, teacher's editions and test spirit masters are each $4.25. Materials such as cassette tapes and "critter cards" are purchased from ISIS at varying prices. Other materials may already be available in the classroom, or may be purchased locally or from ISIS. Costs of using ISIS may be decreased by having students work on different minicourses at different times. This means it is no longer necessary to purchase 30 copies of a text to accomodate all students. A few copies of each minicourse are sufficient for an entire class. Further price information may be obtained from Ginn and Company.

ISIS provides for interactions which help prevent isolation. Students do some activities together, play learning games, and become involved in activities

Figure 2-6

Individualized Science Instructional System (ISIS)



ISIS, Individualized Science Instructional System, Publicity Brochure. Lexington: Ginn & Co., 1977.

from Kahle, p. 29.

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which help make the learning process enjoyable. It has been tested and used by thousands of schools throughout the country and has been found to be an effective curriculum alternative, with the emphasis placed where it should be, on the student.

Many individualized instructional materials and systems have been developed, but their success is dependent on their effective implementation. Although ISIS was the only curriculum reviewed, there are many other alternatives. The type of curriculum chosen should be evaluated fully before and after implementation to determine effectiveness. Individualization can be a useful addition to any science curriculum and will probably find a larger place in today's and tomorrow's schools.

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A Crisis in Nonmajor Science Education

SE 5050

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Florida Institute of Technology
Summer 1981

Herbert A Smith in "A Report on the Implications for the Science Community of three NSF-Supported Studies of the State of Precollege Science Education" (1979) prepared for the American Association for the Advancement of Science states:

> Improving quality is not just a matter of developing up-to-date curricula. That was done in the 1960's by various groups with generous financial support from the NSF. Data in our research indicate that the new curricula have not been particularly effective. They are viewed by teachers and students as "elitist," and they are in that they were produced at a time when Sputnik required a national emphasis on producing more scientists--not an emphasis on educating all students to understand the nature of science.[19]

The contribution of science to the total general education of students needs immediate attention. This is important for all students. It is especially critical for those who will graduate from college and who will eventually assume leadership positions in business, industry, and government but who will not pursue studies of science professionally. One of the constant complaints of members of the scientific community is that key executive and legislative leaders do not understand their needs or the need for a continuing commitment to basic research. Money spent on basic research in the United States as compared to other technologically active countries has been declinging for several years.[19] Currently, the United States ranks sixth on monies spent for this necessary enterprise; and if the present administration has its way, next year we will rank below most other Western industrial societies. Whether better general education in science, which would explain more fully the nature of science and its contributions to mankind, would accomplish the needed

orientation for our leaders and nonscientifically trained citizendry is uncertain. Nonetheless, the scientific literacy problem is presently at a crisis stage in our national existence. If citizens are ever to fully appreciate and understand this technological society and its problems, a minimum scientific literacy is essential. The intensity of this crisis may be more fully understood when one realizes that war, pollution, overpopulation, racism, sexism, aggression, starvation, health, abortion, mutation, and fallout are directly related to science, yet our citizens are overwhelmingly scientifically illerate! Therefore, our democratic society must educate itself or face countless disasters unprepared to make a rational decision.

There have been several attempts here at the Florida Institute of Technology and elsewhere, to design science courses for nonscience majors, interdisciplinary courses, and courses with the expressed or implicit goal of scientific literacy. One difficulty in designing a course to establish a scientific literacy rests with a definition of the term . In its most elementary form literacy is the ability to read, write, and count. Literacy also implies that the individual must be a learner, listener, seeker, speaker, thinker, and evaluator. Behaviorally, Bernard F. Gross has defined the stages of the literacy process as follows:

A. learning terms;
B. converting word stimuli into concepts;
C. reading, discussing, and writing about these concepts;
D. analyzing these ideas into less inclusive concepts and synthesizing them into more inclusive concepts (proliferating ideas);
E. making value judgements on these concepts and on their implications for mass and his environment.[8]

A science course which contains provisions for these stages creates the best possible climate to assist learners in improving their scientific literacy.

M. O. Pella and his associates (1966) have expanded the definition of scientific literacy to include those individuals who can evaluate and understand:

1. basic concepts in science;
2. the nature of science;
3. ethical principles which guide scientists;
4. interrelationships between science and society;
5. interrelationships between science and technology[8].

Pella's results were based upon an extensive study of the literature dealing with science in contemporary society.[8]

P. D. Hurd (1978) clearly outlined new goals for science education. He suggests science be presented as scientific enlightenment with an emphasis on productive knowledge. He sees science as concentrating on useful ideas and understandings that can advance society; he sees a value-focused science where moral and ethical implications are basic and he declares that traditional factual approaches have failed and are no longer feasible nor defensible![21]

The National Teachers Association (1971) devised another definition of scientific literacy using a list of attributes possessed by scientifically literate individual. This individual is defined as one who:[21]

1. uses science concepts, process skills, and values in making everyday decisions as he interacts with other people and with the environment;
2. understands that the generation of scientific knowledge depends upon the inquiry process and upon conceptual theories;
3. distinguishes between scientific evidence and personal opinion;
4. identifies the relationship between facts and theory;
5. recognizes the limitations as well as the usefulness of science and technology in advancing human welfare;
6. understands the interrelationships between science, technology, and other facets of society, including social and economic development;
7. recognizes the human origin of science and understands that scientific knowledge is tentative, subject to change as evidence accumulates;
8. has sufficient knowledge and experience so that he can appreciate the scientific work being done by others;
9. has a richer more exciting view of the world as a result of science education;

10. has adopted values similar to those that underlie science so that he may use and enjoy science for its intellectual stimulation, its elegance of explanation, and its excitement of inquiry;
11. continues to inquire and increase scientific knowledge throughout life.[21]

Additionally, Klopfer (1968) offered us a more manageable definition of the three essential components of scientific literacy.

1. the first, but least important component, was an understanding of key scientific concepts and principles;
2. the second is related to how scientific ideas developed--the process of science; and
3. the third involves an understanding of the interaction between science and culture.[21]

Understanding scientific concepts and principles is important, yet few of those commenting on this in the literature consider it crucial. Interviews with several non-science advisors, administrators, and students here at the Florida Institute of Technology, at Brevard Community College, and at the University of Central Florida reinforced the idea that science should be presented as a dynamic process not as a collection of facts and principles, especially to non-majors.

A recent NSF status study reflects the current unidimensional view of the general science courses in our schools. Most of the discussions center on the major topics and/or concept groupings with the comment that this overwhelming emphasis on content is important because it might be "needed someday." Most curricula from elementary to post-secondary levels can be characterized by a single word--the textbook. Most teachers merely "go through the book."[21] And to complicate matters even further, numerous studies indicate that our nations science teachers are poorly trained and, especially at the elementary school level, do not have positive attitudes toward teaching science. J. K. Olson (1979) recommends that science teachers be trained to present science as a dynamic process. He recommends teachers move "beyond their classrooms" into the real world and begin to accept "more rather than less responsibility for their science curriculum" rather than depending on a standard text.[13] Further

M. Piper and L. Hough (1979) in their attitude studies found that:

> It appears that the concept of science as a body of verified knowledge was so overstressed that each time an explanation or method of finding a solution to a problem was not mastered, the teacher in training was moved farther away from liking science...only those teachers participating in an active dynamic involved learning role increased their positive attitudes toward science.[15]

Apparent from the preceeding material is the following professional concerns:

1. there is a critical need to create a scientifically literate citizendry;
2. the majority of the students are not and will not become professionals in science;
3. scientific literacy is definable; and
4. the present curriculum, defined as the "content textbook" has failed to educate not only the students but additionally has reduced the effectiveness of the science educator.

Current research by D. S. Dean (1978) entitled "The Nonmajor: A Challenge and a Responsibility" states that nonmajors are often misjudged and considered as unidentified fillers in courses designed for someone else...He suggests that if we are to deal effectively with current educators realize that:

1. nonmajors are not by definition less able than majors;
2. nonmajors forced to take a science elective against their will often lack motivation, therefore it is up to us to find ways to relate dynamic science to them;
3. nonmajors can bring a rich mixture of special knowledge to science;
4. the course for nonmajors should not consist of an introduction to courses they will never take;
5. no educator can "cover" biology in a quarter or semester;
6. the relationship of science to the concerns of the students as human beings, citizens, and thinking people must be explicitly addressed;
7. the science course for nonmajors should not be a sociology course nor should it be a "first grade" course;
8. the population in nonmajor classes is likely to be quite diverse in ability;
9. content is not the most important factor, students must have practice in handling value-laden issues, educators must emphasize the ability to think, to arrive at logical humane conclusions, and be responsible citizens;
10. finally, teaching nonmajors is a critical activity worthy of our best educators.[4]

As a result of these concerns and others , M. R. Green in "Learning Theory Applied to Biology Education" (1978) has called for a new direction in biology curriculum development with an emphasis on learning rather than teaching.[7] Marvin Druger in "Humanizing the Introductory College Biology Course" (1979) states that science courses should "provide a meaningful, motivational, personalized, broadening, and memorable life experience." He further declares that humanizing and personalizing the course does not dilute the literacy requirements or minimize the hard work necessary to maintain a high standard of achievement. The intent is to add a new dimension which recognizes the student as a human being and transcends as well as extends cognitive learning processes. His paper won a 1979 prize in the Gustav Ohaus-NSTA Awards Program for Innovations in College Science Teaching and includes the following unique methods:

1. personalized audio-tutorial modules containing humorous skits etc;
2. audio-tape labs providing instructor assistance;
3. weekly scheduled discussions of application principles;
4. one lecture session weekly designed to motivate students by emphasizing relevance;
5. a weekly newsletter including student gossip, responses, unique facts, recipes, and personal sketches of the staff as well as scheduling;
6. film nights with applicable movies i.e. "Fantastic Voyage" and a relaxed atmosphere;
7. a phone-in service before exams;
8. keyed exams handed-out at the end of each exam period and discussed at that time;
9. conferences for the only purpose of "knowing" the instructors;
10. departmental picnics;
11. take-home labs including residence-hall dissection demonstrations;
12. unit by unit student evaluation and adaptation of the course by the department.[5]

Mr. Druger has found this approach increases student awareness and interest on a college-wide basis.[5]

Saunders and Dickinson (1979) support this idea. Their research concluded that in planning and implementation of science curricula, the lecture only or the lecture and "kitchen-lab" approach to instruction needs to be complemented by additional instructional environments which offer an opportunity for active student involvement with the instructor, other students, and the scientific process, in order to enhance academic achievement, scientific literacy, and attitude toward science.[17] Additionally, B. J. Finlayson-Pitts and R. C. Belloli (1979) suggest that labs in science should be self-designed experiements selected to illustrate science as a process.[6] David Husband (1973) has carried individualization a step further by designing twelve basic lesson units each containing several alternative concept packages for student selection.[9] Benedict and Butts (1981) concludes that laboratory computer simulation exercises in combination with independently-designed research projects maximize the learning experience in nonmajor psychology courses. A unique method using readings in science fiction was implemented by G. H. Marks (1978) at the University of Texas. Using science fiction literature, "illustrates the imaginative scientific and technological possibilities and our human reactions to them "he states. Further, the literature stimulates value-laden discussion and establishes an interactive state in the classroom.[10] Finally, Alvin Saperstein (1978) reports on the most extreeme and most successful application of a curriculum designed to establish scientific literacy in Great Britain in his article "Science Teaching the the Open University in Great Britain."[16]

In the late 1960's the British government set up the Open University as part of an attack on the class structure of British education; its function was to:

1. offer working adults unrestricted admission to a program of higher education on par with that of the regular university system;
2. establish literacy in the several disciplines necessary for the proper development of democratic human culture;
3. avoid overspecialization common at other universities; and to
4. use modern technology to accomplish its function in an economical manner.[16]

While this may seem a large order to fill, the research to date supports the University's claim to overall success. The manner of achievement of this success is mammoth even by American standards. The Open University serves the entire of Britain and Northern Ireland and enrolls over 20,000 students annually. Students upon admission must complete six courses of study, including two foundations courses to obtain a bachelor's degree. Work on the course lessons are done at home, in neighborhood study centers, and at residential summer schools held on the regular university campuses throughout Britain. The course material is devoted to printed handouts, television demonstrations, radio discussions, cassette tapes, home laboratory kits, computer center work at regional sites, and phone consultations. Lesson design is a team effort among several university departments and the weekly assessment mailings monitor student progress. Final assessment involves an examination board composed of the course team and faculty members from other universities.[16]

Science has unique strengths that educators have yet to fully top, for to teach students that scientific models are dynamic is to provide them with a mechanism for dealing with the future.[14] Our historical presentation of science orients the student toward science as a static presentation of past facts, and present procedures, without a true idea of the failures, possibilities, consequences, or transience of our knowledge. Science has become dry and historical when it really should be perceived as dymanic and theoretical.

Alternative presentation methods must be implemented if we are to create a scientifically literate population which will guarantee our nation the protections and benefits available through scientific methodological applications.

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SECONDARY SCHOOL REMEDIAL MATH OF THE 1980s

Barbara Holzworth

Project Report
SE 5050
Dr. Richmond

Summer 1981

Outline

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Bibliography

Purpose

To study and present a reform project for a national curriculum in secondary school remedial math.

Central Idea (1,2,3,4,5,6,8,9)

In the process of selecting a secondary school remedial math curriculum, an educator will find no national projects on the subject of remedial math. Therefore, the developer of a secondary school remedial math curriculum must first examine case studies of remedial math programs and then must select related data from a current reform project for a national curriculum in general mathematics, such as the Priorities in School Mathematics Project (PRISM) that was designed by the National Council of Teachers of Mathematics (NCTM).

Introduction (1,2,3,4,5,6,9)

In the 1960's, public attention was focused on the apparent attempts at the revision of mathematics programs. In the 1970's, the concern of the public was directed toward problems evidenced in mathematics test scores. In the 1980's, the public must give consideration to the coordination of mathematics programs and mathematics test scores.

I. Objectives (6)

PRISM presented four objectives:

1. Provide a broad national view of preferences about mathematics curriculum content.

2. Reflect a broad national view about priorities for mathematics curriculum change.

3. Identify broad national opinions on amount of emphasis needed for particular concerns in the current mathematics curriculum

4. Propose recommendations for mathematics curricular change as a result of analyzing the collected data.

II. Participants and Their Qualifications (6)

Nine populations, selected from lists obtained from appropriate organizations, were sampled for PRISM: 1. subscribers to the Arithmetic Teacher, 2. subscribers to the Mathematics Teacher, 3. junior college mathematics teachers, 4. college teachers of mathematics, 5. supervisors of mathematics, 6. mathematics teacher educators, 7. principals of elementary and secondary schools, 8. presidents of school boards, and 9. presidents of parent-teacher organizations.

The return rate on preferences survey forms ranged from 15% to 60% for the nine samples, with an average of 29%; the priorities survey ranged from 10% to 62% with an average of 34%. "Since the intent was to obtain reactions from those who have an interest in the school mathematics program," the collected data can be considered representative of those persons with such high interest despite low response rates.

III. Methodology (1,6)

A. Survey of Preferences (6)

"The first component of PRISM was a survey of preference for alternative content topics, instructional goals, resources, methods, provisions for particular groups of students, and ways of using calculators. Each of these was considered for nine content strands in the precollege curriculum: whole numbers; fractions and decimals; ratio, proportion, and percent; measurement; algebra; geometry; probability and statistics; computer literacy; and problem solving.

A pool of 660 strand items, plus 30 demographic items and 45 introductory items, was developed. Item-sampling techniques were used to allow a larger pool of items than would have been possible if a single instrument had been given to all

persons. Each survey from contained either 110 or 120 items, plus 15 demographic and introductory items, with sets of items systematicall distributed across forms."

B. Survey of Priorities (6)

"The second component of the PRISM study assessed priorities for curriculum change or for methods of addressing problems in mathematics education. Respondents were asked to judge the relative importance of curriculum alternatives, identifying points in the mathematics curriculum where change seems most needed or desired. Forced-choice items presented five alternatives to be rank-ordered in terms of the priorities for the 1980s. For some items, ... samples were given a set of five reasons to indicate why they assigned highest or lowest priority as they did. General factors and ways to approach problems in mathematics education were also considered. In all, ... samples responded to 92 items" or "84 items. In addition. 15 demographic and introductory items were included, as on the preference survey."

C. Introductory Items (6)

As mentioned in the above two descriptions of PRISM surveys, "each respondent reacted to 15 introductory items on the preferences survey or 8 items on the priorities survey. Each item reflected an issue of particular concern in the current mathematics education community. Respondents were asked to indicate whether each should receive "much more emphasis," "somewhat more emphasis," "about the same emphasis," "somewhat less emphasis," or "much less emphasis" than it currently receives."

D. Recommendations (1,6)

Prism generated a vast amount of data. Only key points were selected to form the recommendations, using as criteria the levels of agreement or disagreement across and between samples.

IV. Content (1,6)

Six recommendations summarize the information processed by PRISM; each of the six recommendations are outlined below.

1. Problem solving must be the focus of school mathematics in the 1980s: samples supported the importance of applications for solving problems in everyday life, gaining skills necessary for employment, making consumer decisions, and preserving student options in career or vocational choices.

2. The concept of basic skills in mathematics must encompass more than computational facility: samples supported (a) spending over 50% of instructional time on drill and practice activities for whole numbers, fractions, and decimals, (b) worksheets for providing practice at the end of each lesson, (c) mastery of whole number computational skills before graduation from high school, (d) teaching particular content in order to teach students to read mathematics, (e) having available materials with minimal requirements, (f) the goal of enabling students to read and think critically about graphs and data in other subject areas, and (g) logical reasoning as a goal.

3. Mathematics programs must take full advantage of the power of calculators and computers: samples supported (a) integrating computer literacy topics within the present curriculum, (b) a course that helps students understand how calculators and computers handle mathematics, (c) writing programs and flowcharting, (d) including roles of computers in society, the types of problems computers can solve, and the introduction of alternative techniques for solving problems, and (e) using calculators for checking answers, or doing a chain of calculations involving several different operations.

4. Stringent standards of both effectiveness and efficiency must be applied to the teaching of mathematics: samples supported (a) providing booklets of experiments (but, not laboratories), (b) using manipulative materials, small-group instructions, and out-of-class activities, and (c) homework and text materials with daily homework problems.

5. The success of mathematics programs and student learning must be evaluated by a wider range of measures than conventional testing: although samples ranked

evaluation of mathematics learning and achievement of high priority, minimal support was given to increasing emphasis on minimal competency testing and norm-referenced testing.

6. More mathematics study must be required for all students and a flexible curriculum with a greater range of options should be designed to accommodate the diverse needs of the student population: samples clearly supported (a) more than a one-year requirement of mathematics in order to graduation, (b) differentiating programs on the basis of career or vocational goals, and (c) meeting the needs of the handicapped and low-achievers.

V. Comprehensive Evaluation of the Project (1,2,3,4,5,6,7,8,9)

A. Data for Curriculum Planning

PRISM included explicit data about the learners, society, knowledge available to be taught, and external forces.

B. Defining Goals and Objectives

PRISM formulated purposes, goals, subgoals, and instructional objectives. However, few questions were asked about how students should be assessed.

C. Selecting Appropriate Curriculum Design

PRISM included a vast amount of specific data on instructional goals and subgoals, alternate content topics, resources, methods, and provisions for particular groups. A combination of several designs could be utilized in the PRISM curriculum.

D. Planning Curriculum Implementation: Instruction

As illustrated in the paragraph above, many teaching models could be used.

E. Evaluating the Curriculum

Again, PRISM has great deficiencies in assessment; assessment seems to be left up to local personnel. However, opinions regarding mathematics requirements for graduation were requested; but, no means of testing competency in the areas required were suggested.

Conclusion (1,2,3,4,5,6,8,9)

The public must be actively involved in the coordination of the development and evaluation of a more diversified, application-oriented mathematics curriculum and mathematics tests--both organized around effective and efficienct problem solving utilizing the tools of basic skills and computer/calculator technology.

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THE ADVANCED PLACEMENT PROGRAM: ITS PLACE IN THE CURRICULUM

SE: 5050

August 6, 1981

Elizabeth Kantosh

INTRODUCTION

What is the Advanced Placement Program?

The Advanced Placement Program is a a four-way educational endeavor, involving students, secondary schools, colleges, and the College Board - Educational Testing Service. The students are college-bound, academically oriented young people who wish to pursue college-level studies while still in high school. The schools are secondary institutions that choose to bear the additional costs of offering these studies. The colleges involved encourage and recognize such achievement by offering credit, and/or advanced standing to students who demonstrate proficiency by passing a test. The pivot of the program is Educational Testing Service, which supplies the test, scores the tests, and furnishes the colleges with students' scores.

Who is Responsible for the Curriculum of Advanced Placement Courses?

The curriculum of Advanced Placement courses is the responsibility of a development committee made up of secondary school and college teachers appointed by the College Board to overlapping terms. These committees function as subcommittees of the Board's academic advisory committees, each of which is responsible for all College

Board tests and examinations in a subject. In other words, the committee of teachers decides what is to be taught in a certain course and designs the test to evaluate student success at mastering the material. A course description booklet is written for each offering in the program, which at the present time includes art, biology, chemistry, English, French, German, history, Latin, mathematics, music, physics, and Spanish. This course descriptions are reviewed annually and published every spring. They are regularly distributed to participating schools and colleges and are available to other on request. Although the course descriptions are designed primarily for teachers, department heads, and curriculum coordinators, they can serve as useful guides for students who wish to prepare for the examinations through independent study. These course description booklets may be ordered from College Board Publication Orders, Box 2815, Princeton, NJ, 08541, for $2.00 per copy.

What about the Examinations?

The Advanced Placement Examinations are offered throughout the world each May. Each test is given on a specific day. They cost $38.00 each and are administered at participating schools or at multischool centers by school personnel, usually the curriculum coordinator or

guidance counselor. No examination is longer than three hours, but most require a full three hours of working time. All the examinations contain either an essay or problem-solving section; most of them also contain a section consisting of objective questions.

Who Grades the Tests?

In June the examinations are graded by college and secondary school teachers familiar with the Program, brought together especially for this purpose and serving under the direction of a Chief Reader in each field. Precautions are taken to ensure the fairness and reliability of the reading. The Chief Readers - college professors who sit with the development committees and later direct the reading (grading) - develop initial grading standards in consultation with their immediate assistants. The other graders then join in the determination of more detailed expectations. Throughout the grading, measures such as the assignment of each examination book to several graders, the deliberate obscuring of previous graders' grades as well as of the students' names and schools, and the continuous monitoring of graders' work by table leaders are intended to keep the graders' judgments as reliable as possible. The questions on the objective

sections are scored with a correction factor to compensate for random guessing, and they are set at such a level of difficulty that students performing acceptably on the free-response section of an examination need answer only about half the multiple-choice questions correctly to obtain a total grade of 3.

What Does a Grade of 3 Mean?

The total raw scores are converted by the Chief Readers to the Program's five-point scale: 5 - Extremely well qualified. 4 - Well qualified. 3 - Qualified. 2 - Possibly qualified. 1 - No recommendation. The objective questions are used both to provide high reliability (the likelihood that a candidate repeating the examination would receive the same grade) and to provide links with former year's examination, in order that a candidate who earns a grade of 3 on one year be at the same level of competence in the subject as candidates who earned grades of 3 in other years.

The Program deliberately publishes its essay questions, and so must use new ones every year. But the stability of grades is maintained in two ways. First, in subjects where enough objective questions are used, it is possible to make direct comparisons between the performance of the current year's candidates and that of a previous

year's candidates on a set of identical questions. Other psychometric techniques make it possible to use these data to calibrate the objective sections of the two examinations with reasonable accuracy. Thus, the effects on candidates' grades of different essay questions from one year to the next can be minimized, but the success of the procedure depends on the objective questions' remaining secure. The Chief Readers also compare the general distributions of grades in their subjects to those of the last few years and consider other pertinent data to arrive at decisions on grades.

In early July the grades are reported to the students, their secondary schools, and the colleges they are entering. Students' essay booklets are available, at cost, to their designated colleges. Those not requested by students' colleges are similarly available to their schools.

How Do Colleges Respond to AP Courses?

Many colleges grant credit and placement automatically for qualifying work on the examinations. Some grant either placement or credit only. Others are still establishing their policies. Teachers who provide advanced studies with the hope of their students' receiving credit and advanced placement at college must realize that all colleges do not follow the same procedures upon receipt of Advanced Placement Examination grades.

In 1977 the College Board Trustees adopted and published a set of Guidelines, as they apply to expected college use of Advanced Placement Examination grades. When colleges use AP Examinations, they should:

1. Grant placement and credit for a demonstrated competence, regardless of how it was attained.
2. Develop explicit AP policies and procedures, requiring levels of mastery on AP examinations not significantly different from successful performance in related local courses.
3. Have faculty review the college's AP policy in their fields.
4. Publicize these policies clearly, indicating the examinations accepted; how students gain access to them; the grades for which placement and credit are awarded; and the amount of credit given.
5. Charge no tuition for AP credit.
6. Ensure that qualified AP students are placed into appropriately advanced courses.
7. Accept transfer AP credits that meet local standards.

ADVANCED PLACEMENT COURSES IN THE CURRICULUM

At the present time, Advanced Placement courses are being offered in two representative counties, Brevard County and Okaloosa County, as examples of the flexibility which can be employed in their implementation. According to Dr. Jane Chaney, Director of Curriculum for Brevard County, the courses are selected by each individual high school, and each school decides on the mode of instruction. The subjects offered, in one school or another, are calculus, history, English, and the sciences, chemistry and physics. Some schools have special Advance Placement courses; others enroll students in regular second-year courses, the ones who are interested in Advanced Placement do additional work by following the A-P course description booklet. The students who wish to take the test make arrangements with the guidance office.

In Okaloosa County the Advanced Placement course is simply that - with strict adherence to the course description of that discipline. Everyone is expected to take the test, which is scheduled in May each year. The College Board is explicit in what material to cover, and gives a topical outline, list of materials, as well as a description of what the test is like. Sample questions and essay items are also supplied in the booklets.

THE PROS AND CONS OF ADVANCED PLACEMENT

However the program is offered in the high school curriculum, Advanced Placement is a boon to gifted, able students. It serves as an introduction to college-level work, exposing students to a higher level of scholarship. Students save money by taking college courses in high school.

However Advanced Placement courses may not be "free" entirely. Many courses require the student to purchase a text book, because college texts are not on the state-adopted list for high schools. There are other ways for high schools students to get a head start on college. One way is the CLEP test which will give advanced placement. Many colleges have early enrollment programs for local high school students. Florida Institute of Technology offers up to fifteen quarter hours of course work, tuition free, to qualified juniors and seniors in high school. Finally the test itself is expensive, $38.00.

High schools which have Advanced Placement offerings in their curricula have enough diversification for even the most gifted and demanding students. Parents and students in such schools are comfortable with the knowledge that these courses are available, should they want to enroll in them. The flexible approach used in many schools allows students to enroll in a regular class and do individualized self-study

to meet the requirements of the test.

The schools offering Advanced Placement courses have a number of problems to overcome. There is the scheduling problem: the science classes require a double period to allow sufficient time for lab. The cost factor must be consistered: extra books, extra supplies and equipment for science classes.

A word should be said about what is expected of the teacher who agrees to teach Advanced Placement classes. The College Board recognizes that a college-level course imposes a burden on the already harried teacher, and suggests that these teachers be given an extra planning period to prepare, grade, work on the A-P classes. If these teachers were working in the college system, their class loads would be one-half of what a high school teacher must meet every day. Also these teachers would receive supplemental pay for teaching courses at the local junior college.

Unfortunately with falling enrollments and the reduction in staff which accompanies it, every teacher must carry his/her full allocation, which in the academic courses is 135 students. Falling enrollments will eventually have an effect of Advanced Placement offerings, because of the lack of enough gifted, able students to fill the classes.

A high school graduate who has passed the Advanced Placement test with a score of 4 or 5 is extremely well-qualified and a proven, serious student, so colleges should welcome them with enthusiasm. On the basis of their records they should be excused from basic or introductory courses. They should be admitted to more advanced courses and allowed to proceed an at accelerated rate. Florida Institute of Technology gives credit and advanced placement for different courses with A-P grades of 4 and 5. Students with grades of 3 must take a test to determine placement. Not many students take advantage of this method of receiving credit, as each year no more that twelve freshmen request advanced placement and credit on the basis of the high school A-P courses.

At a time of peak college enrollment Advanced Placement was hailed as a way to cut down on crowded introductory courses. What its status will be in light of the leveling-off or decline in enrollments is speculation.

THE FUTURE OF ADVANCED PLACEMENT PROGRAMS

For a number of years education was undergoing a period of dynamic growth. Continually rising enrollments, rapid expansion of facilities, increases in personnel, ballooning of school budgets - all were reflected in the perspective with which educators viewed the curriculum.

During that period the approaches could best be described as "curriculum sprawl", as ever more and varied offerings were added to meet one mandate or the other, or to satisfy this or that group, or to implement this idea or that concept.

Those days appear to be over now and education is in decline. With the decline in enrollments fewer students mean fewer classes. Fewer classes - fewer courses. And of course there will be fewer teachers. These trends may lead to a period of "curriculum condensation", which could mean:

1. courses with small enrollments would be dropped,
2. diversified offerings would be combined: in science for example, an Advanced Biology Course could take the place of Anatomy, Botany, Zoology,
3. emphasis would be put on general courses, such as tenth-grade English, general chemistry, etc.

What this portends for Advanced Placement Courses is anyone's guess.

A number of steps should be taken at this time. Curriculum coordinators can design self-study curricula and explain the flexibility of such studies to the students who might be interested in advanced courses. Teachers can single out the able students in their classes and agree to supervise these students in self-study programs. Along with

classwork in their regular classes, these self-study programs can prepare students to take the Advanced Placement tests. Any student who is willing to extend himself should be given the opportunity to get a head start on his college career which is afforded by the Advanced Placement Program. With the help of curriculum coordinators, teachers, and administrators this program can be available to all who desire it, even in the face of declining enrollment.

ADVANCED PLACEMENT PROGRAM IN TWO FLORIDA COUNTIES

	High School	Enrollment	Advanced Placement Courses	Enrollments in Adv. Place.
BREVARD COUNTY	Melbourne High	1325	English Calculus Biology * Spanish ** German **	50 8 10
	Eau Gallie High	1600	English Chemistry *	15 5
	Palm Bay High	1700	English Art	20 10
	Satellite High	no information		
OKALOOSA COUNTY	Choctawhatchee High	1900	English History Calculus	48 20 10
	Fort Walton High	1800	English Biology History	45 22 20
	Niceville High	1300	English History Calculus Biology	43 25 20 24

BREVARD COUNTY

OKALOOSA COUNTY

* Advanced Placement candidates are enrolled in regular classes

** Independent study students

ACKNOWLEDGEMENTS

Conversations with:

Dr. Jane Chaney, Supervisor of Curriculum and Instruction, Brevard County Board of Education

Mrs. Frances Edwards, Guidance Department, Melbourne High School, Melbourne, Florida

Mr. Don Albert, Guidance Department, Eau Gallie High School, Eau Gallie, Florida

Mrs. Marilyn Buchanan, Guidance Department, Palm Bay High School, Melbourne, Florida

REFERENCES

Advanced Placement Course Description - Chemistry

Copyright 1979 by College Entrance Examination Board

Twenty-five years of Advanced Placement Program: Encouraging the Able Students, H. P. Hanson

Educational Digest 46:48 - 51 March, 1981

Advanced Placement Oriented Calculus for High School Students, K. Mexynski and J. C. Stanley

Journal of Research in Math Education, 11:347 - 55 November, 1980

Advanced Placement Program - F. I. T. Policy

Office of Admissions, F. I. T., Melbourne, Florida

FLORIDA INSTITUTE OF TECHNOLOGY

MELBOURNE, FLORIDA 32901

Office of Admissions

Phone: (305) 723-3701, ext. 395

ADVANCED PLACEMENT PROGRAM - F.I.T. POLICY

Florida Institute of Technology recognizes the College Board Advanced Placement Program. Our policy with regard to granting of credit is as follows:

BIOLOGY - Students with a grade of 4 on the biology exam will be granted credit for F.I.T. course B-1001. Students with a grade of 5 will also be given credit for B-1002.

CHEMISTRY - Students with a grade of 4 on the chemistry exam (both Sections I and II) will be given credit for F.I.T. course C-1001 and 1011. Students with a grade of 5 will also be given credit for C-1002 and C-1012.

ENGLISH - Students receiving a grade of 5 on the English exam will be granted credit for XE-1021 and XE-1022. Students receiving a grade of 4 on the English exam will be granted credit for only XE-1021. Students receiving a grade of 3 on the English exam may be granted credit for XE-1021 at the discretion of the English Department after review of the student's Advanced Placement Examination, Part II.

MATH - Students receiving a grade of 4 on the calculus AB exam will be granted a minimum of 1 term's credit in calculus and appropriate pre-requisites. Students receiving a grade of 4 on the calculus BC will be granted a minimum of 2 term's credit in caculus and appropriate pre-requisites. Additional credit may be granted after consulation by the student with the mathematics department.

PHYSICS - Students receiving a grade of 4 or better on the physics B examiniation are eligible for F.I.T. course credit as applicable to the program of study for P-2131, P-2132, and P-2133. Students receiving a grade of 4 or better on Part I of physics C examination shall receive credit for F.I.T. course P-1063. Students receiving a grade of 4 or better on Part II of the physics C examination shall receive course credit for F.I.T. course P-2071.

LANGUAGES - Students receiving a grade of 3 will receive 3 quarter hours of credit; a grade of 4, will receive 6 quarter hours of credit; and a grade of 5, will receive 9 quarter hours of credit.

Other subjects not listed above, namely, American history, art, classics, European history, music: students receiving a grade of 3 or higher in any of the above exams shall receive credit only in those areas which are considered requirements for a degree program at F.I.T. No credit shall be awarded as an elective.

Students receiving a grade of 3 or better on any of the Advanced Placement Examinations, but not receiving F.I.T. credit under the above provisions shall be eligible to apply for appropriate credit by examination at Florida Institute of Technology without paying the usual fee for credit by examination.

FLORIDA INSTITUTE OF TECHNOLOGY

EARLY ENROLLMENT PROGRAM

Q. What is F.I.T.'s Early Enrollment Program:

A. It is a special program whereby high school juniors and seniors of BREVARD and MARTIN counties can enroll - tuition free - for up to 15 hours of college credit (max. of 6 hours per quarter).

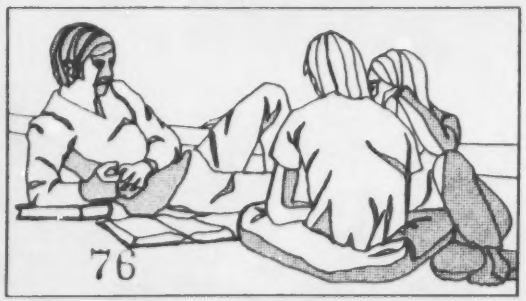
Q. If I am interested in F.I.T.'s Early Enrollment Program, how do I apply or seek admission to the program?

A. All students who wish to take advantage of the above opportunity should contact the F.I.T. Admissions Office at 723-3701.

Q. What are the requirements for admission into F.I.T.'s Early Enrollment Program?

A. The students seeking admission must meet the following requirements:

a) Above average performance in related courses in high school.
b) Submission of official high school transcript.
c) Overall above-average grades.
d) Above-average SAT/ACT scores.
e) Must have completed first semester of Junior year.
f) Be at least 17 years old.
g) Official written permission.



Q. If I meet the entrance requirements when is the best time to apply for admission?

A. Registration for Early Enrolled students will be one week prior to start of classes and will be on a space-available, first-come, first-serve basis.

Q. Are the credits I earn through the Early Enrollment Program transferable?

A. The credits earned under the Early Enrollment Program are applicable towards the student's degree requirements at F.I.T. However, if a student should desire to attend another university without matriculating at F.I.T., a transcript will be released only upon payment of the regular F.I.T. tuition for all hours received under the Early Enrollment Program.

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FLORIDA FINANCIAL AID OPPORTUNITIES FOR FLORIDA HIGH SCHOOL GRADUATES:

The following is an often-asked question:

"I don't qualify for any federal grants but I need financial assistance in order to attend F.I.T. Where can I get some financial aid?"

FLORIDA TUITION VOUCHER FUND

One portion of the Florida Higher Education Act provides $750.00 per year to Florida resident students who enroll in a private university or college in the State of Florida as a freshman after July 31, 1979. To be eligible for the Tuition Voucher, you must:

a) have been a resident of Florida for two years prior to the date of your enrollment,
b) be a Florida high school graduate,
c) be registered as a freshman or sophomore after July 31, 1980.

The intent of the law is to help equalize the tuition differential if a student chooses to enroll in a private rather than public institution.

To receive an application for the Florida Tuition Voucher, write to: Financial Aid Office, Florida Institute of Technology, Melbourne, Florida 32901.

FLORIDA STUDENT ASSISTANCE GRANTS

All U. S. citizens who have been bona-fide Florida residents for at least two years and who are enrolled or accepted for enrollment as full-time undergraduate students are eligible to apply for aid through this state program. Grants range from $200 to $1200 per year, based upon demonstrated need. Applications must be on file with the State Department of Education by April 1. Further information including application materials is available through most Florida school principals and guidance counselors, as well as through F.I.T.'s Financial Aid Office. Information and application materials may also be obtained directly from: Department of Education, Tallahassee, Florida 32304.

FLORIDA ENGINEERING SOCIETY SCHOLARSHIP

(Melbourne Campus Only)

This scholarship is for a graduate of a Florida Junior College with a degree in Electrical, Mechanical, or Ocean Engineering and who has maintained at least a "B" average. To apply, please write to:

Florida Engineering Society
1311 Executive Center Drive
Tallahassee, Florida 32301
The scholarship covers the cost of tuition.

FLORIDA STATE SCIENCE FAIR SCHOLARSHIP

(Melbourne Campus Only)

Students who win in either the Life or Physical Science categories, on the State level of the Florida State Science Fair, can receive full four-year scholarships in either the Life Sciences or Physical Sciences. To find out how to enter the Florida State Science Fair, please contact your high school Science Department.

THE SELBY FOUNDATION SCHOLARSHIP

(Melbourne or Jensen Beach Campus)

The requirements for this scholarship are:

1. be a bona-fide resident of Florida established prior to tenure in school for transfer students.
2. have combined SAT scores of 1100 (verbal and math) minimum.
3. have a G.P.A. of minimum 3.0 for entering students; transfer students must have a G.P.A. of 3.0 but also a 3.0 in their major.
4. be a full-time student (12 hours minimum).

BRECHT SCHOLARSHIP

This is for students who live in Brevard County, have a strong academic background, show they have financial need, and who will attend a college or university in the State of Florida. Students must apply between November 1 and February 28 for the fall term. You may request an application from F.I.T.'s Financial Aid Office or your high school or college counselor. A copy of your FAF, along with high school or college transcripts, must be submitted to:

Brecht Scholarship
207 Tigert Hall
University of Florida
Gainesville, Florida 32611
(FAF Code 0637)

The Brecht Scholarship is for $700.00 per year and you must re-apply for it each year.

For additional information about F.I.T., please write or call:

Florida Institute of Technology
Office of University Admissions
University Boulevard
Department FA
Melbourne, Florida 32901
305-723-3701, ext. 395.

Florida Institutue of Technology admits students of any race, color, sex, age, national or ethnic origin, or handicap to all the rights, privileges, programs, and activities generally accorded or made available to students at F.I.T.

High School Juniors & Seniors

Learn more about...

F.I.T. and YOU!

- F.I.T.'s Early Enrollment Program for Talented High School Students
- Financial Aid Sources for Florida Residents

EVALUATION OF BIOLOGY: LIVING SYSTEMS

Project Report
Partial Requirement for
Robert F. Richmond
SE 5050

Barbara H. Losson
August 6, 1981

BIOLOGY: LIVING SYSTEMS

The objective of this study is to examine the text Biology: Living Systems, third edition, published by the Charles E. Merrill Publishing Company. This text was chosen to replace B.S.C.S Molecules to Man in the Brevard County School System beginning with the 1980-81 school year.

William Lavinghousez, science teacher at Melbourne High School, provided the following background information as to how the book was selected. He stated that after a five year period the State and County informs the various publishers that they will be reviewing textbooks for state adoption. The publishers are then responsible for sending to the county any copies they wish to have considered. A team of teachers, parents, and administrators then evaluates each book sent. A score sheet is used to evaluated the book. Such things considered are amount of career information, update information on drug abuse, types of illustrations, number of minorities used in pictures, readability, lab manuals, and other supplimentary material.

The science textbook evaluation in Brevard County took place in November, 1979. B.S.C.S. (blue) was not released from the publishers until January, 1980. Due to this delay, their new edition could not be considered.

The evaluation committee decided that Biology:Living Systems best met the needs for Brevard County. It ranked high in readability and could be adapted to the various phase levels. The laboratory manual, "Laboratory Biology;" was chosen for the

phase three students (average ability) and "Probing Levels of Life" was selected for the phase four-five students (high ability). The test evaluation program booklet was also recommended.

The philosophy of Biology: Living Systems is based on these unifying themes:

1. Requirement for energy to maintain the organization of living systems
2. Ability of organisms to reproduce
3. Evolution and relationships among organisms
4. Taxonomy and the characteristics of major phyla
5. Homeostasis and self-regulation
6. Integration of functions
7. Interaction of organisms and their environment

The text is divided into 29 chapters with the authors' attempt to allow for flexibility if the teacher chooses another sequence. "A conscious effort has been made to allow for this flexibility by consisely repeating relevant ideas presented in previous chapters." A course guide of topics is included in the teacher's edition for those desiring a unit approach to subject matter.

The following are listed as teaching features of Biology: Living Systems:

1. Each chapter is introduced with a large color photograph and introductory paragraph. The paragraph relates the chapter to the student world.
2. The chapter begins with a goal statement which identifies the major objectives. These correspond with performance objectives found in the teacher's guide.
3. Each chapter is subdivided into short numbered sections to facilitate planning lessons and assigning reading.
4. New terms are printed in boldface type. They are

either defined within the text or found in the glossary (although the authors indicate each word is defined in the text, this is not always the case).

5. Student margin notes, printed in blue, highlight important points in the text. The marjin notes can be used for preview, review, and study.
6. The teacher's edition had red annotations that may include related material, answers to text questions, or teaching techniques and suggestions.
7. Within each subdivision are questions related to the material just studied. The teacher's edition contains page references indicating where the answers may be found in the text. Summary questions are found at the end of each chapter.
8. At the end of each chapter are a series of questions that are not directly answered in the chapter and also a section called "Extending Your Ideas" that include reports, projects, and classroom debates.
9. Emphasis is placed on spelling and vocabulary. A glossary is found at the end of the book and major terms are listed at the end of each chapter.
10. For the teacher's benefit, there is a planning guide listing the chapters, length of time required to complete the material, and suggested laboratory topics. The authors feel one day per chapter is sufficient for labs.

The teacher's guide contains a detailed section on performance objectives, what they are, what a good performance objective is, and how they are used.

The performance objectives for Biology: Living Systems are grouped as follows:

1. Attitudes- to develop students' attitudes of curiosity of wonderment about and involvement with phenomena in their natural environment; to develop an appreciation for the contributions of science to daily living; and to develop the value and inclinations toward solving problems in a scientific manner.
2. Processes- to develop those intellectual processes of inquiry by which scientific problems and phenomena are explained, predicted, and controlled.
3. Knowledge- to develop knowledge of facts, terminology, concepts, generalizations, and principles which help the students confront and interpret their environment.
4. Skills- to develop the student's ability to handle, construct, and manipulate materials and equipment in a productive and safe manner; and to develop ability to measure, organize, and communicate scientific information.

There is also a section on teaching aids and audiovisual suppliers. Included is a suggested list for each chapter.

Two lab manuals accompany Biology: Living Systems. The one proposed for phase three students in Brevard County requires very little equipment. In fact, it appears to take a workbook approach to lab time. The other manual adopted for the phase four-five students is designed for the average classroom with adequate supplies. Although both of these books are designed to be consumable, Melbourne High School budget did not allow for this. Therefore there is a class set of lab manuals. A great deal of time could be lost if the teacher requires the student to copy charts, drawings, etc.

All the teachers at Melbourne High School had taught B.S.C.S. (blue) and had found it particularly satisfactory for the phase four classes but not as much so for the phase three classes. Biology: Living Systems is a more traditional approach to biology and appears to be more encyclopedic in form.

I asked Mr. Lavinghousez if he could go back to B.S.C.S. blue next year, would he. His answer was no one biology text can be a Bible. He feels that the teacher should have the leeway to teach what he or she is interested in and have several books to choose from. His ideal situation is to have classroom sets of several varieties and pick and choose at his discretion. Since one of his major goals is involving more students in science fair, he will approach his classes this year from a research point of view, what is being done, what the students might do as related to the chapter they are in. He is therefore content to continue using Living Systems. He feels that it is a good source-book but he does incorporate many B.S.C.S labs into his classes. His major complaint was the evaluation test booklet. All of the teachers felt that it needed a great deal of revision. The tests varied greatly in their complexity. All the teachers submitted their evaluation comments to department head, Virginia Whitman. She then forwarded this information to the publishers.

This was my third year to teach biology. The first two years I used B.S.C.S. blue. I felt that this version was too difficult for the phase threes and I personally preferred B.S.C.S. green that I had used during my student teaching. I welcomed Living Systems because of its more traditional approach and it was possible to avoid such a great emphasis on the origin of life as B.S.C.S. did. My main feeling was one of frustration. There seemed no way possible to cover all the material in the chapters and I wasn't sure what to add or delete. I also found the students had difficulty with the standardized tests from the test booklet. On the reproduction chapter I tested them with a Living Systems

test, a B.S.C.S. test, and my own made-up test. The scores were higher on the B.S.C.S. test and the students indicated (in all three classes) that those questions were clearer than the Living Systems test.

Another major complaint was the lab approach. Very little effort is expended in developing the writing of a lab report since most of the responses were fill-in-the-blank type. I felt B.S.C.S. inquiry approach to labs was a much more effective learning tool. Again, I found I used a great deal of my B.S.C.S. materials from the previous years. The lab manual does lend itself to dissection at the end of the year if monies are available for specimens.

As a comparison, I interviewed two people that had used Biology: Living Systems in other settings. First was Edward Donovan. Mr. Donovan taught a general biology class at Tourlellotte Memorial High School, North Grosvenordale, Connecticut. The course description for general biology is as follows:

> Recommended for students in the general or business programs. Ninth grade science required. The course is a factual approach to biology which leads to the understanding of biological concepts. Some lab work involved. Areas of study include the nature of life (chemistry, cell structure, etc.) continuity of life (heredity, genetics, evolution), and a study of the plant and animal phyla. Human biology and the ecological relationships between organisms are also included. Courses open to 10, 11, and 12.

Mr. Donovan was not pleased with the book and felt that it was "too factual." If one examines the perfromance objectives found in the teacher's guide, the majority of these are listed as K (knowledge of facts). There is an overwhelming amount of material

presented and he felt like the student would have difficulty grasping why some things were picked and others omitted. He much preferred the ISIS series of individualized units. He felt the material presented in that format was easier for the student to handle and more relevant to the general biology student's needs and the world they live in.

My second interview was with Alison Heffner. Miss Heffner teaches biology at Perkimen School, a private boarding school in Pennsylvania. Miss Heffner felt that Living Systems lent itself well to the situation at her school. The school emphasizes skill building and has a required study hall at night where homework is required. The book is ideal for this situation. Also she is able to incorporate a great deal of lab work using dissection of many specimens to study the phyla. (Oh, for an extended budget in Brevard County!)

The budget for science in Brevard County has gotten tighter and tighter each year. With this in mind, I can see how Biology: Living Systems could be very advantageous. If additional monies are available, specimens could be added for phyla study.

The phase three student also need reinforcement on basic skills in writing, vocabulary, etc. The book lends itself toward incorporating this much more than the B.S.C.S.blue. I find myself agreeing with Mr. Lavinghousez. No one book is the answer. The teacher should have several sources and be able to highlight his or her particular area of expertise. I welcome the use of Biology: Living Systems in the fall. I know I will have to cut out part of the material but I have alot to choose from!

I feel that Living Systems better meets the educational needs of average students than B.S.C.S. Blue.yet it can be extended for challenging the higher phased student.

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1. Biology: Living Systems: teacher's edition; Oram, Hummer, Smoot. Charles E. Merrill Publishing Company; third edition. 1979.
2. "Laboratory Biology: Investigating Living systems." Kaskel, Hmuumer, Kennedy, Oram.
3. "Probing Levels of Life: A Laboratory Manual." Hummer, Kaskel, Kennedy, Oram.
4. Biology: Living Systems, Evaluation Program (Spirit Duplicating Masters)
5. Virginia Whitman, Science Department Head, Melbourne High School.
6. William Lavinghousez, phase four science teacher, Melbourne High School.
7. Edward Donovan, Ph.D. candidate, Florida Institute of Technology.
8. Alison Heffner, science teacher, Perkiomen School.

PUBLIC LAW 94-142 IN BREVARD COUNTY

Micheline "Rusti" Nichols

Curriculum Planning 5050

August, 1981

PUBLIC LAW 94-142 IN BREVARD

A. Basic provisions of PL 94-142
   1. Definition of handicapped
   2. Child find system
   3. "Bill of rights" for parents of handicapped
   4. The IEP
   5. Support systems
   6. Children in private schools
   7. State Advisory Board
   8. Related services
   9. Funding

B. PL 94-142 in Brevard County and Florida
   1. FDLRS
   2. Legal complications
   3. Specially equipped schools
   4. IEP
   5. Increased personnel

C. Bibliography

D. Attachments
   1. Photos of Creel facilities
   2. Parent Permission form
   3. Procedural Safeguards
   4. Referral forms
   5. IEP form

PL 94-142 IN BREVARD

Public Law 94-142 was enacted in 1975 by Congress and the final regulations were published in August 1977. This act guarantees a free appropriate public education (FAPE) for all handicapped children in the least restrictive environment.

Handicapped is defined the statutes as meaning "mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, or other health impaired children or children with specific learning disabilities who by reason thereof require special education and related services". Also included in the statute are the definitions of health impaired and specific learning disabilities.

Section 612 of 94-142 Statutes states that "all children residing in the State who are handicapped, regardless of the severity of their handicap, and who are in need of special education and related services are identified, located, and evaluated...". A comprehensive evaluation procedure is outlined in § 121a.531. "Under the statute, the age range for the child find requirement (0-21) is greater than the mandated age range for providing free appropriate public education" "...while the State is not required to provide "FAPE" to handicapped children below the age ranges mandated under § 121a300, the State may,...extend services to those children ...". Florida has made for this provision. At Creel all a child needs is a written presciption from a licensed doctor in order to use the facilities free of charge. The theory being that the sooner a handicapped child starts on a prescribed program, the better the prognosis.

A "bill of rights" is provided for in this law, a copy of which is included with this report. Every parent or guardian of a handicapped child must receive and understand this document.

Statute 614 (a)(5) provides " assurances that the local educational agency or intermediate educational unit will establish, or revise, whichever is appropriate, an individualized education program (IEP) of each handicapped child at the beginning of each school year and will then review and, if appropriate revise, its provisions periodically, but not less than annually;..." "The IEP for each child must include:

(a) A statement of the child's present levels of educational performance;

(b) A statement of annual goals, including short term instructional objectives;

(c) A statement of the specific special education and related services to be provided to the child, and the extent to which the child will be able to participate in regular educational programs;

(d) The projected dates for initiation of services and the anticipated duration of the services;

(e) Appropriate objective criteria and evaluation procedures and schedules for determining, on at least an annual basis, whether the short term instructional objectives are being achieved."

Joint meetings must be called periodically between representatives of the public agency, other than the child's teacher, who is qualified to provide special education, the child's teacher or teachers, one or both of the child's parents, the child, where appropriate, other individuals at the discretion of the parent or agency. § 121a.345 outlines a rigid procedure for insuring that one or both of the parents of the handicapped child are present at each meeting or are afforded the oppàrtunity to participate.

PL 94-142 also provides for in service training in § 121a.382; dissemination in § 121a 384 of materials, information, personnel, training, media use, and procedures for an annual evaluation program in § 121a386.

Children enrolled in private schools are also entitled to FAPE as stated in §121a.451. A representative of the school or institution should be included in the IEP planning meetings.

§121.650 calls for each state to establish a State Advisory panel to be appointed by the Governor. This panel must include at least one person representative of each of the following groups;

(1) handicapped individuals

(2) teachers of handicapped children

(3) parents of handicapped children

(4) state and local educational officials

(5) special education program administrators

Handicapped children are entitled to any "related services" required for their IEP. "Related services" means (Sec. 602 94-142Statutes) "transportation, and such developmental, corrective, and other supportive services (including speech pathology and audiology, psychological services, physical and occupational therapy, recreation, and medical and counseling services, except that such medical services shall be for diagnostic and evaluation purposes only) as may be required to assist a handicapped child to benefit from special education and includes the early identification and assessment of handicapping conditions in children." Transportation includes "travel to and from school and between schools, travel in and around school buildings, and specialized equipment such as special or adapted buses, lifts, and ramps, if required to provide special transportation for a handicapped student.

§121a182, 121a.183, 121a.184, 121a.185, and 121a.186 provide regulations and formulas for federal grant and excess costs for 94-142 programs.

In Florida the extablishment of FDLRS (Florida Diagnostic & Learning Resources System) was in compliance with PL 94-142. This agency provides for complete diagnostic services for evaluating in-school handicapped children; in-service

training for parents and educators; dissemination of information, media methods, and materials; consultant services by FDLRS staff or outside specialists; and Child Find for identifying out-or-school handicapped children from birth to 21 years. Florida has 18 FDLRS centers, each one unique and working to meet the identified needs of its service area.

Due to the legal aspects of educating the handicapped because of 94-142, the Brevard County School Board has had to hire a full-time la er. The hearings which may be requested by parents are financed by the local school board. All steps in the IEP must be documented. Attached are samples of a Parent Permission form, "Bill of Rights", referral sheets and a Documentation Form.

Public schools renovated for the teaching of the handicapped are Oak Rark in north Brevard, Mila in central Brevard, and Creel in south Brevard. These schools are specially equipped to provide therapy services as well as educational services.

Central Pine Grove and South Pine Grove Provide education and therapy for the profoundly and trainable mentally retarded children. Special provisions for the hearing impaired are found in River View and Madison in north Brevard, and at Saturn and Kennedy in central Brevard.

Mainstreaming is done when in the best interest of the student. The physically handicapped are easily placed in regular schools which have the proper physical facilities, such as elevators or ramps. Aides are provided for under PL94-142 to work with the regular classroom teacher who class has been mainstreamed.

This year three mini-technical courses are being planned for providing the mainstreamed handicapped student with and employable skill at Astronout, Cocoa, and Mel Hi.

Compliance with the IEP has been the biggest complaint of the teachers in regard to PL 94-142. However, the meetings required for the IEP are brining teachers together and parents and discussing their programs and relating them to each other providing more continuity and carry-over from class to class. A copy of an IEP form is attached.

Under 94-142 no child can be labeled or caragorized. This is intended to remove some of the stigmas involved in the testing and evaluation proceddes.

Special Education classes require more personnell. At Creel Elementary, for example, there are required 7 teachers and 11 aides for the 45 severly handicapped child, a ratio of 1 adult per 3 children. For the 550 non-handicapped or minimuhly handicapped, there are 23 teachers and 5 aides. The handicapped students are mainstreamed into regular classes at every opportunity. The morale of the handicapped students since being transferred from Summit School, has improved immensely. Commented Joe Padula, Curriculum Coordinator of Creel, "You just can't put a price tag on the success we have seen here since this program has started."

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Martha Brown, Director of Brevard County 94-142 programs, Stevenson Elem., Merritt Island, Exceptional Education Center

Patsy Day, Diagnostic Specialist, FDLRS, Merritt Island.

Joe Padula, Curriculum Coordinator, Creel Elem. School, Eau Gallie

EXAMINATION OF INTRODUCTORY PHYSICS CURRICULUM OF FLORIDA INSTITUTE OF TECHNOLOGY

Lyman Rickard

Submitted to:

Mr. Bob Richmond
SE 5050
Curriculum Development
August 6, 1981

CURRICULUM DESCRIPTION

This paper is an examination of the introductory level physics curriculum at the Florida Institute of Technology. The introductory physics courses consist of two tracks depending on the students' majors. The first track is designed for physics, chemistry, engineer, mathematics and other similar majors. The second track is designed for biology, environmental science and other similar majors.

The typical track one sequence consists of Physics 1A and 1B taken during the winter and spring quarters of the freshman year. This is followed by Physics II, III, and IV in the sophomore year. In addition to the basic track one sequence is an introductory course that may be taken prior to Physics 1A and 1B. This course is designed for those students who do not have a physics background from high school or who have very poor math scores on the college entrance exam. Track two consists of three courses typically taken during the sophomore year. Only those students planning to go to professional school (medical, dental, pharmacy) take the Physics laboratory.[4]

The sequence of courses in track one cover the following subjects: Physics 1A and 1B cover mechanics; Physics II covers electricity; Physics III covers wave motion, thermodynamics and optics; Physics IV covers radiation and atomic and nuclear physics (see syllabi in appendix for greater detail).[14] The courses are all calculus based and the text is Physics, Part I and II by

Halliday and Resnick. The textbook is followed in sequence with the exception of the unit on electricity which is covered in Physics II in order for students majoring in mechanical engineering to take courses requiring electricity as a prerequisite at an earlier time.[3] The track one courses are not begun until winter quarter of the freshman year. This gives the student additional time for acquiring a more solid math background and the opportunity for those students who are not adequately prepared for college physics to take the preparatory physics course.[3]

The preparatory physics course uses the same text as the track one courses. The catalog describes the course as non-calculus based but since the same text is used as in track one, calculus is used.[4,7] The course covers approximately the same material that is covered in Physics 1A. One of the goals of the course is to help the student become familiar with the textbook so that when the same material is covered in Physics 1A, he/she will have a head start.[7]

The second track of introductory physics covers the following subjects: Fundamentals of Physics I covers force motion waves and heat; Fundamentals of Physics II covers solids, liquids, gases, sound and electricity; Fundamentals of Physics III covers radiation, optics, instrumentation and radioactivity.[4,14] These three courses are calculus based and stress principles important in the application of physics to the biological sciences. The

text used is General Physics with Bioscience Essays by J. B. Marion.

The laboratory portion of the introductory physics curriculum is independent of the lecture. The laboratory stresses verification of concepts presented in Physics 1A and 1B, understanding the inductive approach and the significance of physical measurements, and practice in experimental techniques.[4,10] The curriculum descriptions of the majority of majors in the catalog do not have the lab courses associated with a corresponding lecture course.[4] All students in track one are required to take the lab but students in track two are not. The majority of the laboratory experiments are of the traditional verification type.[10] Lab instructors are graduate students and adjunct faculty members.[3]

CURRICULUM DESIGN

Curriculum planning for the introductory physics courses was done by a committee made up of faculty members in the physics department.[3] Much of the curriculum was designed around the textbook chosen for the courses. Information from other departments was considered in the curriculum design. This is evidenced by the moving of the unit on electricity out of sequence in order to help mechanical engineering students and the formation of track two in order to provide physics courses more relevant to

the majors in fields related to biology.

The physics department does not have a written set of goals or objectives for the introductory physics curriculum. However, a set of such goals exists at least in the minds of the faculty.[3] The curriculum design is the traditional subject matter/disciplines which is used in the majority of introductory physics curricula in the United States. The primary teaching models used in the curriculum are the lecture, laboratory, and practice and drill. The practice and drill teaching model is related to the homework sets. These are the traditional models for introductory physics.

Evaluation is carried out by observation by the physics department faculty members. If a problem is identified, data is gathered by polling the students. In addition, some of the exams are partially based on exams from the naval academy. This gives a standard against which the students can be compared. Also, some of the courses in the introductory curriculum have remained unchanged over several years and therefore results on test scores can be compared with previous years.[3]

STRONG POINTS

The department seems flexible and concerned with improving the curriculum. This is evidenced by the two tracks, the preparatory course, and a future change which will combine Physics 1A and 1B into one course to produce a four course sequence in track one. This is being done so that the curriculum will more

closely match the curriculum of state supported schools and thus help students transferring to and from F.I.T.[3]

One of the strongest points identified was the faculty. The faculty have good interaction with students and are available for individualized help. In addition to this, there is tutorial help and a moderate amount of tutorial material available to students in a tutorial center. Also, a program that is working well is the "wizard." The "wizard" is a senior physics major or graduate student available to the students each day for individual help.

The department is working to improve the lecture portion of the curriculum by developing demonstrations to accompany the lectures.[3]

PROBLEMS

One of the major problems identified from the student standpoint is the lack of adequate math background of students entering the introductory physics curriculum. This is not a problem unique to F.I.T. but shared by most physics departments.[2,6] The preparatory course and the delay in starting the freshman physics until winter quarter were designed to overcome this problem. However, math still seems to be a major problem for students in the introductory physics courses.

Part of the problem may lie in the way in which the preparatory physics course is designed. Although the catalog describes

the course as non-calculus based, the same textbook is used in this course as in the track one calculus based course. Equations in the book are developed using calculus and some homework problems require calculus. For students with no physics background and few math skills, is it surprising that they do not develop the proper background in this course? Would the students' chances of success in the introductory physics curriculum be better enhanced by developing some of the basic concepts of physics at a level which the student can truly understand? There appears to be evidence that one reason for student difficulty in courses such as physics is not only math but also that many students are not capable of formal or abstract thought necessary for success in physics courses.[8,12] If many students entering the preparatory physics course are at the concrete operational stage as described by Piaget, this would seem to indicate the need for alternative instructional strategies such as have been discussed in the recent literature.[1,8,12] In addition to this, a laboratory associated with this course would certainly assist students at the concrete operational stage who were having difficulty with concepts introduced to them in the lecture.[7,12,13]

One of the major problems identified was that of the laboratory. Laboratory equipment and language problems were cited as major problems.[3] The primary language of many of the students and laboratory teaching assistants is not English. This

causes difficulties from the standpoint of foreign students reading the lab manual and asking questions and the teaching assistants trying to explain the laboratory. In order to improve the level of teaching in the laboratory, half day sessions were begun where the teaching assistants did the experiments themselves prior to teaching it. Lack of motivation on the part of teaching assistants was cited as a major obstacle.[3] This is also a situation which is not unique to F.I.T. where graduate students, whose training and interests are typically in research, are expected to teach undergraduate laboratories.[5,13]

One of the purposes of the laboratory as stated in the catalog and lab manual is to confirm relationships discussed in the text and lecture.[4,10] However, the curriculum described for most majors in the catalog does not attempt to match any lecture course with any of the laboratory courses. It would appear that if this is a purpose of the lab, the lab should be taken at the same time that the relationships are introduced in lecture. Finally, it would seem important to add some experiments stressing the thought processes and reasoning of science in addition to the traditional verification laboratory experiments.[9,11,12]

The choice of textbooks not only seems to be a problem for the preparatory course but also for the track two Fundamentals of Physics I, II, and III. The sourse is calculus based but the textbook is not. Since the mathematics of the physics course

seems to be one of the major problems for students, the students would appear to be at a disadvantage since the textbook does not use calculus. It should be noted that this is not a problem easily overcome since physics textbooks with biological applications are typically not calculus based.

One of the strength mentioned earlier in the paper was the tutorial system for students needing individual assistance. The students working as tutors seem to be knowledgeable in physics but lacking in understanding of how to instruct others. Students seeking help from tutors are often shown how to work the problem they are having difficulty with rather than being led through the problem and allowed to solve it themselves.[7] This method takes more time and patience than simply working the problem for the student. But the student should be able to better cope with future difficulties in problems if instructed by the more time consuming method.

A second feature discussed under strengths was the demonstrations which have been developed to accompany the lectures. There is a problem, however, in the use of these demonstrations due to scheduling of classes in classrooms not suitable for some of the demonstrations. Also, there is a need for an assistant for setting up, taking down, and maintaining the demonstration equipment and materials.

In summary, the problems discussed here are not so much problems of design as they are detail. The preparatory course

is a good idea. Some alternative methods of teaching it should be investigated and then evaluated to see if student performance in subsequent physics courses was enhanced. The same applies to the tutors. It is a good idea that seems to be working but some training of the tutors could be beneficial.

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14. Syllabi for introductory physics courses. (See attachments.)

Date	TOPICS	Assignments
7/14	Review Homework Motion in a Plane Projectile Motion	Chapter 4 Problems 2,3,6,7,12,20
7/16	Review Home Work Uniform Circular Motion Relative Velocity and Acceleration	Problems 23,25,27 32,33
7/19	Review for Test Chapters 3-4	
7/21	Test 3-4	Read Chapter 5 Sections 5-2,5-3,5-4
7/23	Go over test Classical Mechanics Newton's 1st Law Newton's 2nd Law	Questions for Chapter 5 1,2,11 Read sections 5-5,5-6, 5-7,5-8,5-9
7/26	Newton's third law Units Weight & Mass Statics	Problems for Chapter 5 3,- Read section 5-10
7/28	Applications of Newton's Laws	Problems 5,7,10,15,17 21,33
7/30	Home work Review	Read Sections 6-1,6-2,6-3
8/1	Frictional Forces Dynamics of uniform Circular Motion	Questions for Chapter 6 1,8,12 Problems for Chapter 6 1,2,5,11
8/3	Review Homework	Read Chapter 6 sections 6-4,6-5 Problems 25,31,33

SYLLABUS

P 1061, Physics 1A — SPRING 1980
Instructor: Mr. Robert Oleck

Text: Physics, Part 1 by Halliday & Resnick

Week	Topics	Work Problems
1	Vectors, Vector Add. - Components, Vector Products	Read Chapter 1 2/5, 6, 9, 11, 14, 15, 20-26, 32, 34, 37
2	Kinematics, Velocity, Acceleration, Free Fall	3/1, 3, 4, 7-9, 14, 15, 19, 23-26, 29, 30, 31, 32, 34, 35, 39
3	Planar Mot. - Projectiles Circ. & Rel. Motion	4/1, 2, 4, 5, 7, 9, 11, 14, 16, 17, 23, 27, 28, 30, 34, 35, 37, 39
4	Catch-up, Review EXAM 1	
5	Newton's Laws Applications	5/1, 3, 4, 6, 7, 13, 15, 17, 19, 21, 29, 33
6	Catch-up, Friction Cir. Dynamics	6/1, 4, 5, 7, 9, 13, 15, 18, 21, 25-27, 29, 34
7	Work-Const. Force Work-Varia. Force Work-Energy, Power	7/1, 2, 4, 6, 9, 10, 13, 14, 16, 17, 19, 22, 23, 25, 29
8	Catch-up, Review EXAM 2	
9	Conser. Forces, Potential Energy, 1d Sys., >1d Sys., Noncon. Forces	8/1, 4, 14, 15-17, 19, 24, 25, 27, 28, 31, 33, 35, 37-39
10	Conservation of Energy Catch-up, Review	

SYLLABUS

P-1062-01/02 SPRING 1981

Instructor: R. Sawyer [Office: Room S-506]
Text: Physics, Part I by Halliday and Resnick

CHAPTER	TITLE	PROBLEM ASSIGNMENT
09	Conservation of Linear Momentum [Sections 1-6]	3,4,6,7,9-11,13,15,17-20, 23,25,27-29.
10	Collisions [Sections 1-4,(5),6]	1,3,6,9,11,12,16,17,19, 20,21,25,32-35,37.
11	Rotational Kinematics [Sections 1-5]	1,3,5,7,10,11,14-16,22, 23,25.
12	Rotational Dynamics I [Sections 1-7]	1,3-5,8,11,13-16,21,23, 25-27,29,30,34,35,39,40, 42,45.
13	Rotational Dynamics II and The Conservation of Angular Momentum [Sections 1,3,4,(5,6)]	9,11,23,25,27,29.
14	Equilibrium of Rigid Bodies [Sections 1-4,(5)]	2,3,6,8-10,13,15,17,19-21,23.
15	Oscillations [Sections 1-5,(6),7,9,10]	1,3,6,7,10,11,13,19,21, 23,25,30,33,35,37,39,42.
16	Gravitation [Sections 1-11,(12,13)]	1,3,8,9,11,15,18-20,23, 24,29,30,31,33,41,45.
17	Fluid Statics [Sections 1-5]	1,2,4,6,11-13,19-21,23, 26,29,30,32.
18	Fluid Dynamics [Sections 1-5]	1,2,5,6,8,11,15,18,20, 21.

NOTE:(1)The sections that are shown in parentheses ( ) should be read but might not be covered in class !

(2)There will be two one hour exams that will be given on the following dates: EXAM I: Thursday 23 APRIL 81
EXAM II: Thursday 21 MAY 81, both of these exams will be given in GLEASON AUDITORIUM from 4:30 to 5:30 pm or in case of a conflict from 5:00 to 6:00 pm.

SYLLABUS

P-2071 PHYSICS II — FALL 1980

INSTRUCTORS: B. Sawyer <Sections 01 and 02>
R. Jin <Section 03>

WEEK	CHAPTER	TITLE	SUGGESTED PROBLEMS	HOMEWORK PROBLEMS
1	26	Charge and Matter	3,5,8,9-11,13,19,23-25,27.	
	27	The Electric Field	1,5,6,12-14,17-19,23,25,30-33,35,36,38.	
2	28	Gauss' Law	1-5,13-15,17,21-29,31,34.	
3	29	Electric Potential	2,4,5,7-10,12-15,17,19,21,28,29,31-33,39-41,43,44,49,50.	
4	30	Capacitors and Dielectrics	1,2,4-6,10-13,19-22,26,28,31,33,38-40,42-44,46,47,49,51.	
	31	Current and Resistance	1,2,6,9,11,12,15,22,23,30,31,34,36,37.	
5	32	Electromotive Force and Circuits	1,3,7,8,10,12,16,18,19,23,25-2 31,32,34,36-41,44,45,47,49.	
6	33	The Magnetic Field	2,3,6,7,9,13,14,17,19,23-27,36,37,43,45,46,48,49.	
7	34	Ampere's Law	1,3-5,7,9-11,13,17,21,22,24,25,28-30,32,35,37,39,40,42.	
8	35	Faraday's Law of Induction	3,5-11,13,17,18,20-22,23,24,26-28.	
	36	Inductance	1,3,4,7,9,12-14,19,22,23,25,26,28,34.	
9	37	Magnetic Properties of Matter	READ	NONE
	38	Electromagnetic Oscillations	1,2,4,7,9-11,14,16,17,19,22.	
	**********	THANKSGIVING	**********	
10	39	Alternating Currents	1-12,14,15.	

NOTE: FOR SECTIONS 01 and 02 EXAMS WILL BE GIVEN ON THE 3rd and 6th WEEKS

FOR SECTION 03 EXAMS WILL BE GIVEN ON THE 4th and 8th WEEKS

SYLLABUS

P-2072-01 SUMMER 1981

Instructor: B. Sawyer [Office: Room S-506]
Text: Physics, Parts I & II by Halliday and Resnick

CHAPTER	TITLE	PROBLEM ASSIGNMENT
19	Waves in Elastic Media [Sections 1-10]	1-6,8-12,15-21,25-27,32, 33.
20	Sound Waves [Sections 1-7]	1-5,7-15,17-24,27-29,31-34,39,42-44,46,47.
41	Electromagnetic Waves [Sections 1-3,7-9]	2,3,12,13,16,20-23,31,32
42	The Nature and Propagation of Light [Sections 1,2,(3),4,5]	1-3,6,7,10,24-28.
43	Reflection and Refraction - Plane Waves and Plane Surfaces [Sections 1-6]	1,4-7,9,16,17,19-23.
44	Reflection and Refraction - Spherical waves and Spherical Surfaces [Sections 1-5,(6)]	1,12,15,18,19-21,24-30, 33,35-37,40.
45	Interference [Sections 1-8]	1-5,7,9,11,12,17-20,22, 23,25,27,38,39,41,42.
46	Diffraction [Sections 1-6]	2-5,8,10,12-15,18,24,25, 27.
* 47	Gratings and Spectra [Section 1-4]	4,6,12,15,17-19,24,27,28
* 48	Polarization [Sections 1-3]	TBA
21	Temperature [Sections 1-8]	1,6,7,9,11,13-19,23-26.
22	Heat and the First Law of Thermodynamics [Sections 1-8]	1,3,4,6,8,9,11,13-16,18-20,22-26,29,31-36.
23	Kinetic Theory of Gases-I [Sections 1-8]	2-4,6,9,10,13-17,20,21, 27-30,38-41,43-45,49,53.
24	Kinetic Theory of Gases-II [Sections 1-4]	Read
25	Entropy and the Second Law of Thermodynamics [Sections 1-10]	1-5,8-12,16,19,21-25.

NOTE: The sections that are shown in parentheses ( ) should be read but might not be covered in class !

* Chapters 47 and 48 will be covered only if time permits.

SYLLABUS

P-2073-01 SUMMER 1981

Instructor: B. Sawyer [Office: Room S-506]

Text: Physics of the Atom by Wehr, Richards, and Adair

CHAPTER	TITLE	PROBLEM ASSIGNMENT
1	The Atomic View of Matter [Sections 1-14]	7,9-11,13-19,27-30,32,37, 38,39,43.
2	The Atomic View of Electricity [Sections 1-8,(9,10)]	4,5,7,12,15,22,26,28,29.
3	The Atomic View of Radiation [Sections 1-15]	2-5,8,9,17,19,20,22,27, 33-36,38,40,41.
4	The Atomic Models of Rutherford and Bohr [Sections 1-19]	2-4,6,7,11,12,17,21,22,27, 31,32,34,35,37.
5	Relativity [Sections 1-18,(19-21)]	9,10,13-15,19-22,24,25,27- 29,34,35,38,40-44,49,51,55.
6	X-Rays [Sections 1-8,12]	3-5,7,8,12,24-28,29,31,32.
7	Waves and Particles [Sections 1-10]	1-5,11,15-17,20,22,24.
* 8	Matter Waves [Sections 1-7]	3,5-7,9,11-13.
* 9	The Atomic View of Solids [Sections TBA]	TBA

NOTE: The sections that are shown in parentheses ( ) should be read but might not be covered in class !

* Chapters 8 and 9 will be covered only if time permits.

WINTER 1981

P-2131 SYLLABUS

Text: General Physics with Bioscience Essays by Jerry B. Marion

Instructor: Dr. J. H. Blatt: Office Hours: MWF 10-12Noon; M,W 1:30-3PM
Rm 401B

WEEK	CHAP/SEC	TOPIC	ASSIGNED PROBLEMS
1	1 (all sections)	Physical View of the World	1/3, 4, 7, 9, 12, 14, 15, 20
	2.1	Average Speed	
	2.2	Dist.-time graphs	
	2.3	Instantaneous speed	2/1, 5, 6, 7, 10, 11, 13, 15
	2.4	Acceleration	
	2.5	Falling bodies	23, 25, 27, 28
2	2.6	Vectors	39, 41, 43
	2.7	2-dimensional motion	
	2.8	Circular Motion	
	3.1	Force	
	3.2	Newtons Laws	3/3, 5, 7, 9,
3	----	SHORT EXAM: Ch. 1&2	
	3.3	Dimensions of Force	10, 11
	3.4	Mass and Weight	18, 20, 30
	3.5	Applications	
	3.6	Implications	
	3.7	Momentum	
4	3.8	Concept of Torque	
	3.9	Center Of Mass	
	----	Problems/Catch-up	
	4.1	Static Equilibruim	
	4.2	Friction	4/ 1, 2, 3, 7, 9, 21, 23
5	4.3	Torque and Applications	
	-----	EXAM 2 : Chap 3, 4	
	5.1	Gravitational Force	
	5.2	Planetary Motion	5/ 1, 3, 4, 5, 9, 10, 21, 28, 29
6	5.3	Electrostatic Force	
	5.4	Nuclear and Weak Forces	
	6.1	Work	
	6.2	Kinetic and Potential Energy	6/ 1, 3, 4, 9, 14, 15, 17, 24, 27, 36, 37
	6.3	Energy Conservation	
7	6.4	Collisions	
	6.5	Kinetic Energy of Rotation	
	6.6	Gravitational Pot'l Energy	
	6.7	Electrostatic Pot'l Energy	

8	----	Problems/Catch-up	
		EXAM 3: Ch 5, 6	
	7.1	Pressure	7/ 1, 3, 4, 8, 17, 20, 21,
9	7.2 7.3 7.4	Pressure in Static Fluids Boyancy Surface Tension	29, 31, 35
10	7.5 7.5a ----	Fluids in Motion Circulating System Review for Final	

P 212 FUND OF PHYSICS II SYLLABUS WINTER 1980

Instructor: Dr. J. Sharber
Text: General Physics with Bioscience Essays by J. B. Marion

WEEK	CHAP/SEC	TOPIC	PROBLEMS
	6 (6.4-6.7)	Elastic and Inelastic Collisions	6/14, 15, 17, 24, 27, 36, 37
	7 (all)	Fluids and Pressure	7/1, 3, 4, 8, 17, 20, 21, 29, 35
	8 (all)	Temperature and Heat	8/3, 7, 17, 31, 37, 39, 43
	9 (all)	Gas Dynamics	9/2, 4, 7, 16, 21, 22, 29, 31, 37
	10	Elasticity and Vibrations	10/3, 11, 13, 15, 19, 26, 27, 30
	11	Electric Fields and Currents	11/1, 5, 8, 13, 15, 16, 21, 25, 27, 37, 42, 49, 53

Syllabus

P2133 - Fundamentals of Physics III

Spring Quarter, 1981

Dr. J. Burns

Text: J. B. Marion, "General Physics with Bioscience Essays", John Wiley & Sons

Week	Date	Text Section	Topics
1a	3/31	12.1-12.3	Magnetism, electromagnetic effects, force on moving charge in mag. field
1b	4/2	12.4-12.5	Orbits of charged particles, electromagnetic flowmeters, fields produced by currents
2a	4/7	12.6-12.7	Magnetic materials, electromagnetic induction, Lenz's and Faraday's laws
2b	4/9	13.1-13.2	Circuits with V. R. Kirchhoff's rules, L and C in d.c. circuits
3a	4/14	13.3-13.4	Motors, Galvanometer, ammeters, voltmeters, a.c. generators, transformers
3b	4/16	13.4-13.5	Reactance, impedance, rectification, amplifiers
4a	4/21	14.1-14.2	Waves on strings, wavelength, velocity, standing waves, reflection, phase
4b	4/23	14.3	Sound waves, beats, musical sounds, loudness, pipes, doppler effect, hearing
5a	4/28	14.4-14.5	Diffraction, interference, double and single slit, multiple slits, electromagnetic waves
5b	4/30	15.1-15.3	Speed of light, refraction, Snell's law, internal reflection, image formation, lens equation
6a	5/5	15.4-15.6	Mirrors, aberrations, dispersion, spectra, eye, polarization, instruments, resolution
6b	5/7	—	MIDTERM EXAM
7a	5/12	16.1-16.3	Foundations of relativity, time dilation, length contraction, mass variation
7b	5/14	16.4-16.5	$E = mc^2$, principal of equivalence, general relativity, experimental tests
8a	5/19	17.1-17.3	Blackbody radiation, Planck's constant, photoelectric effect, duality, deBroglie λ
8b	5/21	17.4-17.6	Electron diffraction, matter waves, Compton effect, uncertainty principle
9a	5/26	18.1-18.3	Atom models, Bohr atom, energy levels, angular momentum, spin
9b	5/28	18.4-18.6	Exclusion principle, atomic shell structure, periodic table, inner shells, lasers
10a	6/2	20.1-20.2	Nuclear masses, binding, radioactive decay, half life, α, β, γ emission, human effects
10b	6/4	20.3	Nuclear reactions, fission, reactors, biological effects of radiation, nuclear medicine

FINAL EXAM, THURSDAY, JUNE 11, 6-8 PM

Microcomputers for Individualizing Instruction in the Science Classrcom

SE 5050
Summer, 1981

Teresa Stephens

When I first chose the topic of microcomputers I knew virtually nothing about the subject. Delving into the information available I became more and more excited. I had no idea as I am sure many teachers do not, of the capabilities of these mysterious machines.

The biggest word in instructional technology today is the microcomputer. Every where I look I see computers; the Resource Center of the Science Education Department of FIT owns several which are in constant use, Satellite High School owns ten TRS-80 terminals, and Central Catholic High was just donated an AppleII by Harris Corporation. The Today News, August 4, 1981, told of two one-year federal education grants distributed by the State Department Of Education for gifted students to work with computers at Surfside Elementary, Divine Mercy Elementary, University Park Elementary, and Our Lady Of Lourdes Parochial School. Surfside and Divine Mercy will share about $ 9,000 for Project Computeronics. The money will go for supplies and the purchase of a computer. University Park already owns a computer. The school will share about $3,450 with Our Lady Of Lourdes for a computer skills program. Yet, many teachers are reluctant to incorporate computers into their curricula either because they lack training in computers or because they mistakenly believe that computer programs are of little value in a course that is not strictly mathematically oriented.

Education is the business of information processing, not just storage and transmission. The computer, an informa tion processor is a much more significant tool for education

than are audio tapes, slides, films and video tapes used specifically for information storage and transmission. Used together with computers these traditional media become much more effective. We as teachers cannot neglect our students the valuable training computers can provide and we must do all we can to acquaint ourselves with their potential in the classroom.

In a recent study conducted by Carlton W. Knight II and Gary E. Dunkleberger it was shown that the use of computer-managed self-paced instruction improved the attitudes of High School chemistry students toward science. A study by Swartz and Long (1967) showed that students preferred computer-assisted instruction to self study.

Computer-assisted instruction (CAI) as it is called has unlimited applications in the science classroom. Computers can be used to help students master specific objectives. For example, Salvatore Tocci in East Hampton New York uses computers to help his students understand the use of the metric system. Using the program the student first selects whether the measurements are to be in volume, distance, or weight. With conversion factors provided he choses the initial unit (i.e., centimeters) and the one to which it is to be converted (i.e., kilometers). The program generates a random number for each conversion; if the student chooses an incorrect answer, the computer informs the student of the right response. The prompt feedback given the student seems to be the most important aspect here, mentioned again and again as one of the major advantages of CAI.

Salvatore Tocci has also developed an individualized biology curriculum making use of interactive computer programs. The course consists of 17 learning activity packages each containing an introduction, learning objectives, optional activities, nongraded posttests, graded tests, and an evaluation form filled out by each student. Each student plans and executes a program of study for each objective based on the available resources which include cassettes, filmstrips, slides, programmed worksheets, films, library and textbook readings, laboratory investigations, television programs, and CAI.

Jerrol Windbigler has individualized her chemistry class by using a computer. Specific advantages that she lists are; a. a large number of similar problems can be generated quickly so that each student can be assigned a unique one to solve b. problems developed by the computer can be stated in the teachers own mode of speaking, making them more familiar to the student c. programs are available for future use and d. the act of writing programs helps teachers locate difficulties in the assignment. Often she will assign a given problem one day and post answers the next. The program is then rerun to generate new values for variables and is distributed to students to be turned in for grading. She says students like the low pressure approach and usually turn in correct responses. She also uses the computer for checking laboratory results. The computer checks the mathematical accuracy and prints a message telling the student whether he is within

the calculative limits set by the teacher. If the error is to great a humorous insult appears along with a request that the student rework the problem or seek help. If the work is acceptable a complimentary message appears along with the percentage error and a grade. Ms. Windbigler says " I am endlessly amazed at how hard a student will work just to be called a "fledgling chemist" by a piece of hardware". Other benefits of CAI she noted were the students immediate reciept of feedback and their opportunity to correct mistakes with no more penalty than a mild insult. As an added inducement students can rework problems to lower their percentage error and raise their lab grades, some students even come in on their lunch hour.

CAI can be used as a self check. It allows students to determine their level of mastery of learning objectives. Rather than use a straightforward multiple choice approach Salvatore Tocci chooses a more interesting format. For the posttest at the end of a unit on cell structure the student is given command of a spaceship that has been assigned to explore the interior of the cell, the student makes choices based upon data recieved by the onboard monitoring systems. Three incorrect orders results in the ships destruction.

Computer games have been developed to stimulate a sense of competition with the computer. One example involves the study of mitosis and a program that simulates a casino gambling game. The computer randomly produces the generation time for a cell and the total time period involved in the mitotic divisions. The student then determines the number of cells present at the end of that period. If he answers exactly he is payed 5 to 1, if he is within 10 percent he is payed 2 to 1, and if he is within 20 percent he is payed even. Question difficulty depends on the amount of money wagered. If the student goes broke the computer informs him of the evils of gambling, if he "wins" the computer prints out a check for the correct amount.

In my research I talked with Mike Kratzer, head of the science department at St. Johns Lutheren High School in Ocala FL. He mentioned the use of laboratory simulations as being very worthwhile in his biology classrooms. He is currently working with seven Radio Shack TRS-80 terminals. There are simulations available involving titrations, diffusion and osmosis, caloric content calculations and various other laboratory procedures. There are also available simulations involving environmental and ecological problems. A student is confronted with a problem such as overcrowding or excessive

pollution and must make decisions given various data as to the best course of action to be taken. This allows the students to experience the decision making process while giving him an awareness of current problems.

Mr. Kratzer introduced several problems teachers may encounter while trying ti implement a CAI program. First is the cost of buying the computer system and various software to accompany it. Most money now is being obtained through federal and state grants, a matter that will be delt with later in this paper. He also mentioned that although there are many very good software programs available there are also many poor ones and most times you cannot view a program before you purchase it unless you know someone who already owns it or have attended a conference where it has been demonsrtated. Writing your own programs is time consuming but with practice the process becomes more efficient and once a program is written it can be used over and over again. Students enjoy helping debug programs and it serves as an excellant learning device for them.

Mr. Kratzer also uses the computer and printer to construct word search puzzles, which he says his students enjoy. He puts the words he wishes the students to find into the computer and the computer does the rest; printing him a

copy of the puzzle and a copy of the answer key.

Computers are important in remedial assistance and testing. Questions can be stored and randomly retrieved one at a time from a file. With the use of the printer a hard copy of the test can easily be produced. The results of student performances can be recorded and subsequently retrieved and reviewed by the teacher and the student.

Raym Lacey, an instructor at Satellite High School in Melbourne, FL, has ten Radio Shack TRS-80 terminals at his disposal. He is currently using them in his computer science and algebra courses and says it is a shame that more teachers do not utilize this facility. Mr. Lacey feels that many teachers are stuck in a rut, afraid to change and not willing to put the time into learning how to implement a new tool. Mr. Lacey uses the computers for testing. He now has a program for 50 questions and each time the computer program is called it reshuffles the order so that each of the ten terminals has a different order of questions on the screen. He has also developed a tutorial program. The computer presents a problem, the student works it, and if it is incorrect several pages of text come upfor review, the student then reworks the problem. If the answer is still in correct the student may choose to move on to the next problem or raise his hand for teacher assistance.

Competency-based instruction, which many schools are attempting to implement, is tailor made to be managed by computer. The computer can keep track of each student and help to quickly pinpoint trouble spots.

The teachers schedule can be eased a great deal by the

use of a computer which can keep class lists, score tests, generate tests, and other low level remembering tasks. The teacher is freed for more goal oriented activity such as instruction design, evaluation, reviewing new material, individual attention to students, parent-teacher interaction, and professional growth.

These are but a few of the thousands of applications for computers in education. The resourcefull and creative teacher will think of many more.

Having glimpsed the boundless applications of the microcomputer I next wondered which features to look for when purchasing a computer and how much I might expect to pay. The four most popular models for high school use seem to be; Radio Shacks TRS-80, the Apple II, the Commodore PET, and the Atari 800. Some features to look for are; a. a CPU including keyboard with 16K bytes of internal storage and the capability of adding additional memory. b. a convenient output to a television monitor. The size of the output monitor must be readable some distance from the monitor for possible use as a computerized blackboard. A 32 character output line is adequate. c. a convenient medium of program storage, for example the audio cassette or mini floppydisk systems. The mini floppydisks are a little more expensive but have the advantage of greater spead and reliability. d. a high speed printer. All of the systems mentioned will support the new Centronics P-1 which is fast and quiet. e. portability. All of the systems mentioned can be placed in their entirety on a cart and moved from classroom to classroom. With increased portability the computers have

increased versatility. More teachers see what they can do, more users appear, computer fear disappears, and computer education spreads. f. ease of service. Any Radio Shack will accept the TRS-80 for service and PET advertises their system can be serviced by a TV technician. g. low cost. A 16K CPU, plus monitor, cassette recorder, expander box, and printer is about $1900. The addition of the mini floppydisk brings the cost to $2300. This is the cost of the complete system!

Now that we know what to look for we need to know where to look. Any Radio Shack will carry or can order the TRS-80. There is a Radio Shack located on Babcock Street here in Melbourne. The Apple II computer can be purchased and serviced locally at H.I.S. Computermation Inc. on Cypress Avenue or at Modern Computing Inc. on US 1 in Rockledge. Apple Inc. can be written for a list of other dealers; Apple Computer, 10260 Bandley Drive, Cupertino, CA, 95014. Commodor Computers and Peripherals dealing in PET are located in Melbourne on East Lincoln Avenue. Atari 800 is available on 192 in West Melbourne at Computer Haven Inc. These are just a few of the increasing number of dealers available for demonstration and ordering of computers and related equipment.

Financing is usually a matter that puts a halt to many excellant educational projects, but given the versatility of the computer there are many ways of recieving government funding. The microcomputer offers the educator the ability to enhance and expand learning opportunities that correspond to the objectives of several title programs. Some of the funding acts that might be looked into are;

Education For The Handicapped Act (P.L. 94.142), Instructional Materials And School Library Resources-Elementary And Secondary Education Act, Title IV, Part B (P.L. 95-561), Improvement In Local Education-Elementary And Secondary Education Act, Title IV, Part C (P.L. 95.561), Vocational Education Act- Educational Amendments Of 1976 Title II (P.L. 94-482 and 95-40), Compensatory Education/Aid For Dependent Children Act--Elementary And Secondary Education Act, Title I, Gifted And Talented Children Act....Higher Education Act, HEA Title IX, Part A.

Schools may also apply for funding by developing proposals conforming to the guidelines provided by the following sources; the National Science Foundation (NSF), National Endowment For The Humanities (NEH), Fund For Improvement Of Post Secondary Education (FIPSE), Apple Education Foundation. Addresses for these foundations can be found in the Apple Computer Educator's Information Booklet. Most states have improvement funding programs.

A few steps to getting started in writing your proposal: 1. Develop a concise description (one or two pages) of your project with a specific target group and objective in mind. 2. Review your description with your institution grants-person. Review the grant sources mentioned and check on others. 3. Decide on funding sources and review published guidelines. If this years addition is not available try and get a copy of last years edition.4. Check on deadlines; local state and federal. 5. Follow the guided steps in providing information required by the proposal or grants coordinator if you are working with a

district proposal.

As computer costs drop they will become more prevelant in both homes and businesses, accelerating their acceptance as a usefull tool in science education. The implications of personal computing for science education are dramatic, even to the extent of changing some of the objectives of science teaching, Science teachers must face this reality and accept this versatile resource with an open mind+willingness to help our students acieve all they can.

> The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires.
>
> -William A. Ward

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    Head of the math department
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